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City of Tampa Management Analysis and Report System (MARS). Volume 1 Case Study

Tampa Water Dept., FL

Prepared for

Municipal Environmental Research Lab.
Cincinnati, OH

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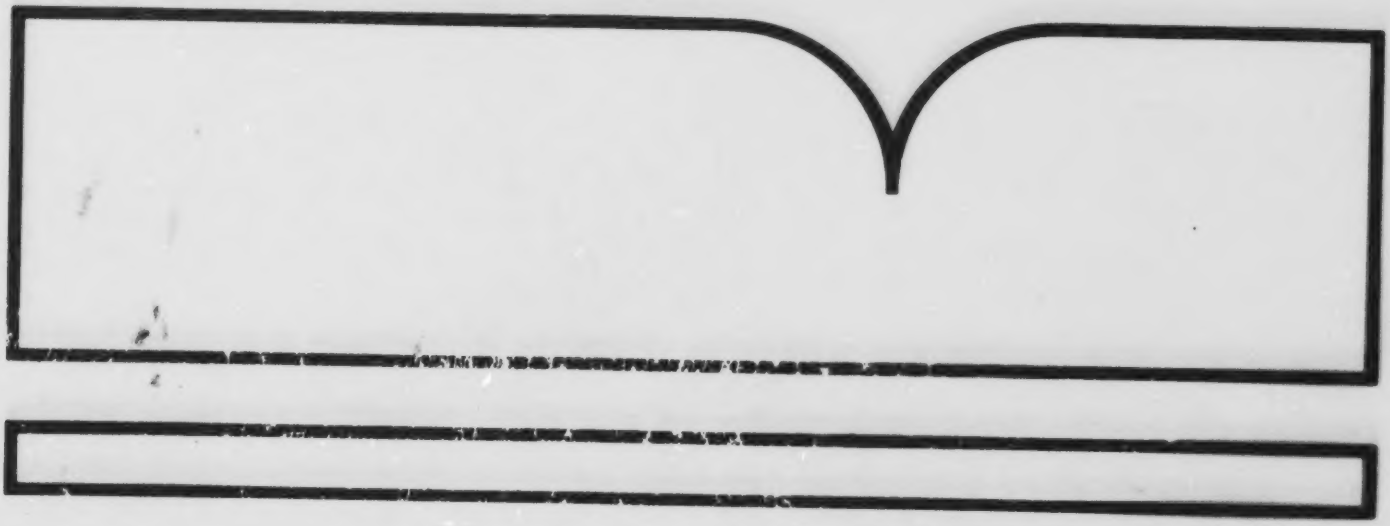

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CITY OF TAMPA
MANAGEMENT ANALYSIS AND REPORT SYSTEM
(MARS)

VOLUME I
(CASE STUDY)

by

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16. ABSTRACT

This three-volume report describes the development and implementation of a management analysis and report system (MARS) in the Tampa, Florida, Water and Sanitary Sewer Departments. Original system development was based on research conducted in a smaller water utility in Kenton County, Kentucky. MARS will help both the Water and Sanitary Sewer Departments control costs and manage expanding service requirements more effectively and efficiently.

MARS was able to meet project objectives and satisfy the reporting requirements of the Tampa Water and Sanitary Sewer Departments with information furnished monthly. The system is considered proven because it has produced reports as required in a stand-alone environment.

Volume I documents the results of 2 years of activities in adopting the MARS to a large water utility and to a wastewater utility; Volume II contains operating instructions for the MARS programs; and Volume III, primarily a system analyst's/programmer's guide, contains the source code for all computer programs in Tampa's MARS.

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Although the information described in this document has been funded wholly or in part by the United States Environmental Protection Agency through assistance agreement number 807440-01 to City of Tampa Water Department, it has not been subjected to the Agency's required peer and administrative review and therefore does not necessarily reflect the views of the Agency and no official endorsement should be inferred.

FOREWORD

This document has been prepared for the City of Tampa by its Consultant, Act Systems, Inc. and reviewed and adjusted by City personnel, in fulfillment of Cooperative Agreement No. 807440-01 between the City of Tampa and the Drinking Water Research Division of the Municipal Environmental Research Laboratory of the U.S. Environmental Protection Agency.

This report documents the activities and the results of two years of activities (June 1980 through May 1982) adapting the Management Analysis and Report System (MARS) to a large water utility and to a wastewater utility. The project was accomplished in two phases. Phase I was documented in an interim report, of which all key elements are included in this final report. A second volume of the report contains the operational instructions describing how to use the MARS programs.

A third volume of this report contains all of the information associated with the computer and MARS programs that were developed for Tampa. The three volumes provide complete information on the activities of the programs, the difficulties encountered, the solutions, and the computer programs developed for Tampa.

ABSTRACT

The U.S. Environmental Protection Agency entered into a cooperative agreement with the City of Tampa, Florida, to implement a Management Analysis Report System (MARS) for use by the Tampa Water and Sanitary Sewer Departments. This research and development application of MARS requires that its concepts and programs be adapted from a small utility (Kenton County, Kentucky, Water District No.1) to a large water utility (Tampa). The cooperative agreement also included the adaption of MARS to a wastewater utility operation and conversion of the computer programs for operation on a small computer.

This report discusses the schedule, activities, and conclusions of the total two year program. It describes the planning and system development where the Tampa financial reporting system and the water and wastewater operations interface with MARS. It also discusses conversion of the computer programs from a large to a small computer, as well as interface of the programs with the Tampa data. The report identifies conclusions based on the experience at Tampa.

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SECTION 1

INTRODUCTION

In May, 1980, the U.S. Environmental Protection Agency (EPA) approved Cooperative Agreement No. CR807440-01 (CA) between their Drinking Water Research Division in Cincinnati, Ohio and the City of Tampa, Florida. The CA was for a two year research and development project to install and evaluate a Management Analysis and Report System (MARS) at Tampa's Water and Sanitary Sewer Departments.

The background of the MARS started with the Safe Drinking Water Act of 1974 (PL-93-523). A primary feature of the Act is that the economics and cost of water supply and water delivery must be considered before regulations are promulgated. In 1974 a two-year study of selected water utilities was undertaken, whereby cost data were collected from at least one Class A water utility (revenues greater than $500,000 per year) in each of the ten regions of the EPA. The purpose of the study was to collect historical cost data in such a manner that the resulting information could easily be compared among utilities, thus providing an understanding of some of the fundamental factors that affect the cost of water supply and utility management.

One conclusion resulting from the investigation was that although each of the selected utilities kept financial records, and in some cases extensive ones, the data among utilities varied to a marked degree. Another conclusion was that many of the records were kept primarily for accounting purposes and had little relation to the short- and long-term operational needs of the utility managers. After carefully analyzing the data flow of some large and small utilities, the investigators developed a technique for data collection and analysis that would fulfill both managerial and accounting needs. This technique, which was based on a matrix concept, was tested by means of a water supply simulation model developed by the Drinking Water Research Division in Cincinnati. Since the technique proved both effective and efficient in a hypothetical situation, an application of the concept was to be made at a utility for operational verification. Kenton County, Kentucky, Water District No. 1 (KCWD) was chosen for the project.

Based on knowledge gained during the special cost studies on utilities, a plan was devised and computer programs were developed to provide managment information from the utility financial data. The programs were to include features that would assist in making them transferable to other utilities. At the start of the Tampa project, MARS had functioned at KCWD for about two years, during which the outputs were effectively used for

management purposes. Because the project was successful at KCWD, the EPA decided to verify its usefulness through application at another utility. Since it appeared axiomatic that the system could be transferred to a utility similar to KCWD, it was decided that the transfer should be to a larger utility, both to evaluate usefulness of MARS and to verify some of the system's transferable features. Other possible evaluation of MARS was also generated; i.e., the possibility of its application to a wastewater utility and its ability to function on a small computer.

The City of Tampa had recently expanded its treatment facilities for both the Water and Sanitary Sewer Departments. The expanded treatment processes, along with inflation, caused the operating cost in both departments to increase rapidly. Tampa's city-wide accounting system, called FIN, provided the normal accounting information as well as some special reports for each department; however, it did not provide all the specific information desired by management, nor was the information provided in a format that was easily used by utility management. Thus, utility management personnel were looking for a tool beyond their existing system to assist in controlling cost.

The Tampa Water Department participated in the EPA cost data program as discussed earlier, and through this activity were aware of the development of MARS and its successful application at KCWD. Because MARS contained many of the features that the City believed would assist in controlling costs, the City discussed with the EPA the possibility of a MARS application in Tampa. The interest reflected by Tampa in the cost data program, and their desire for utility management reports, identified the City as a good candidate for the transfer of MARS to a large water utility. Tampa's wastewater utility also appeared to be a good candidate for MARS, since their operational costs increased significantly as a result of a recent addition of an advanced waste treatment facility. After investigating several possible utilities, the EPA chose to develop a CA with Tampa. In May 1980, the CA was approved by the EPA and accepted by Tampa, allowing the MARS application to start. Tampa selected Act Systems, Inc., the Consultant that developed MARS, to assist them with the application.

SECTION 2

THE ORIGINAL DEVELOPMENT OF THE MANAGEMENT ANALYSIS REPORT SYSTEM (MARS)

CONCEPT

The cost studies, forerunners of MARS, required that the financial data gathered from the utilities be documented in a format that would allow cost comparison between utilities. Since each utility differed in its physical, management, and financial structures, costs were documented, using the functions of a water system as the basic format. Water utilities may differ in characteristics, but all are generally similar in function. Each utility must acquire, treat, and deliver water. Therefore, if the data from each utility could be rearranged so that separate costs associated with acquisition, treatment, and delivery of water were identified collectively a cost comparison between utilities could be made.

Figure 1 is a simplified schematic of a typical water utility, showing the concept of dividing the water utility into the functions of acquisition, treatment, and delivery. The technique can be adapted to all water utility systems regardless of their physical structure; for instance, a well or well field could have been the raw water source rather than the reservoir. An expansion of the concept would allow identification of costs not only to the specific functions of acquisition, treatment, or delivery but also to the subfunction level. As shown in Figure 1, a subfunction level of acquisition includes source of supply, reservoir, pumps, and transmission lines. A subfunction level of delivery includes pumps, storage tanks, transmission, and distribution.

By proper layout of these sublevels, which includes making sure that every part of the physical system is included in a sublevel with no overlapping areas, and identifying cost to them, the complete physical utility becomes a group of cost centers. The cost center can become as small as the utility wishes, to document activities which include cost. As the water moves from its source to its destination, costs can be transferred from the cost centers to the water. For example, as shown in Figure 1, the acquisition costs consist of all costs for acquiring and moving raw water to the treatment plant. When the water enters the treatment plant it starts to accumulate treatment cost and continues to do so until the treated water is ready to leave the treatment area. The cost of treating the water can be added to the acquisition cost which will identify the

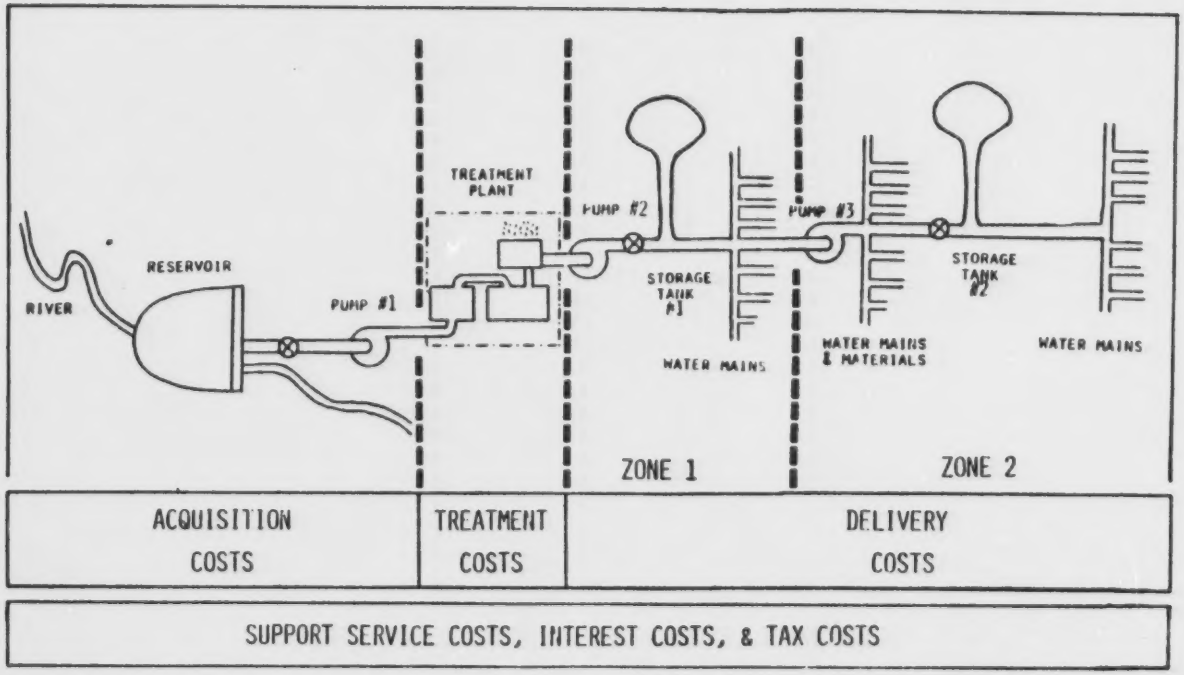

Figure 1. Water utility simplified schematic.

cost for producing the water to that point. Cost also is incurred by additional pumping within the treatment plant to move the water into the delivery area. However, since the purpose of pumping is to move water into the delivery area, it is considered a subfunction of delivery. In addition, costs such as transmission and distribution are accumulated in each zone. The transmission costs are those for moving water to zone 1 and zone 2. The distribution costs include the network of mains and laterals that deliver water to customers in zones 1 and 2. An analysis of the system in Figure 1 reveals that an element of the pumping cost for pump No. 2 is incurred to move water through zone 1 to zone 2, and another cost element is incurred in delivering water through the laterals to customers in zone 1. Similarly, the transmission mains include both a transmission cost element and a delivery cost element. Storage costs are assigned only to the zone in which the storage facility is located because no element of this cost is applied to any other zone.

Two types of costs were identified as the technique was refined. One type was associated directly with the operating functions of acquisition, treatment, and delivery; the other type could not be identified with any specific operating function. The latter nonoperating costs which include billing, accounting, management, etc., were placed in a separate category called support services as illustrated in Figure 1.

Within this general concept, two basic types of information are required as shown by the matrix in Figure 2. Across the top of the matrix are listed the specific utility functions of acquisition, treatment, delivery, and support services. These functions can be subdivided into the smallest component desired, such as a pump. Note that this type of information correlates with the physical utility system depicted in Figure 1. Down the side of the matrix is the financial data that identifies the costs (labor, power, etc., generally recorded by a chart of accounts) of operating the utility. Documentation of costs in this format makes it possible to retrieve and display the various levels or types of information desired. For example, the cost of labor for treating water can be determined by examining the first cost category listed within the treatment function. This is the concept upon which MARS development was based.

BRIEF DESCRIPTION OF KENTON COUNTY WATER DISTRICT NO. 1

Since the original development of MARS was implemented at the KCWD, a brief description of that service area follows.

The KCWD service area is situated across the Ohio River from Cincinnati. KCWD has a raw water intake on the left bank of the Licking River, approximately 4-3/4 miles upstream from the Ohio River. The treatment plant, located in Taylor Mill, Kentucky, presently has a 12.0 MGD rated capacity. After the raw water has been treated, it flows into a clearwell. From the clearwell, treated water is pumped by two primary pumping stations, one at the treatment plant and one at Dudley Pike, into the distribution system.

COST CATEGORY	WATER UTILITY FUNCTION			
	AQUISITION	TREATMENT	DELIVERY	SUPPORT SREVICES
LABOR				
POWER				
CHEMICALS				
MATERIALS				
MISCELLANEOUS				

Figure 2. Function and cost category information.

The distribution system, containing approximately 160 miles of pipe, consists of three pressure levels. The first pressure zone, and its storage tank, is served directly by the pumping capacity at the treatment plant. The second pressure zone, which provides water to the largest service area, is supplied by gravity from three elevated storage tanks or by the capacity of the main pump station located at Dudley Pike. The third pressure zone is fed by gravity from two elevated storage tanks in the Northern Kentucky Industrial Foundation Park and the City of Florence or by the two booster stations on Turkey Foot Road at Lafayette Avenue.

Figure 3 is a map of the Kenton County Water District No. 1 service area, showing the locations and relative sizes of the three pressure zones.

CONCEPT OF OUTPUT REPORTS

The development of MARS and its application at KCWD are documented in a two-volume report published by the Municipal Environmental Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268, titled Development and Application of a Water Supply Cost Analysis System.

The first step in the development of MARS was to identify the desired outputs. Four levels of cost reports were designed to provide information for specific levels of management, ranging from detailed (for line supervision) to summary reports (for top managers).

The Level IV report was developed to provide detailed cost information. The Level III report relates the detailed cost by general, standardized categories. The Level II report compares actual expenditures with budgeted amounts and with expenditures for the previous year. The Level I report summarizes the cost data and identifies the cost per million gallons ($/MG) of revenue producing water (RPW) (RPW is the amount of water from which revenue was derived) for the major cost centers and the total cost of the system. Costs for the previous month, the previous year, and the budgeted amounts are also compared on the Level I report. Detailed descriptions of the output, including reduced reproductions of the computerized reports, are provided in this section; however, only sample pages of the complete printout are shown.

Level IV Report - Detail of Costs by Cost Center

The Level IV output (Figure 4) is in matrix form. The horizontal rows represent the general ledger cost accounts and the vertical columns represent the cost centers that follow the physical layout of the KCWD utility system. The dollar amount of cost by general ledger account for each cost center for the current month is displayed at the appropriate intersection of a row and a column.

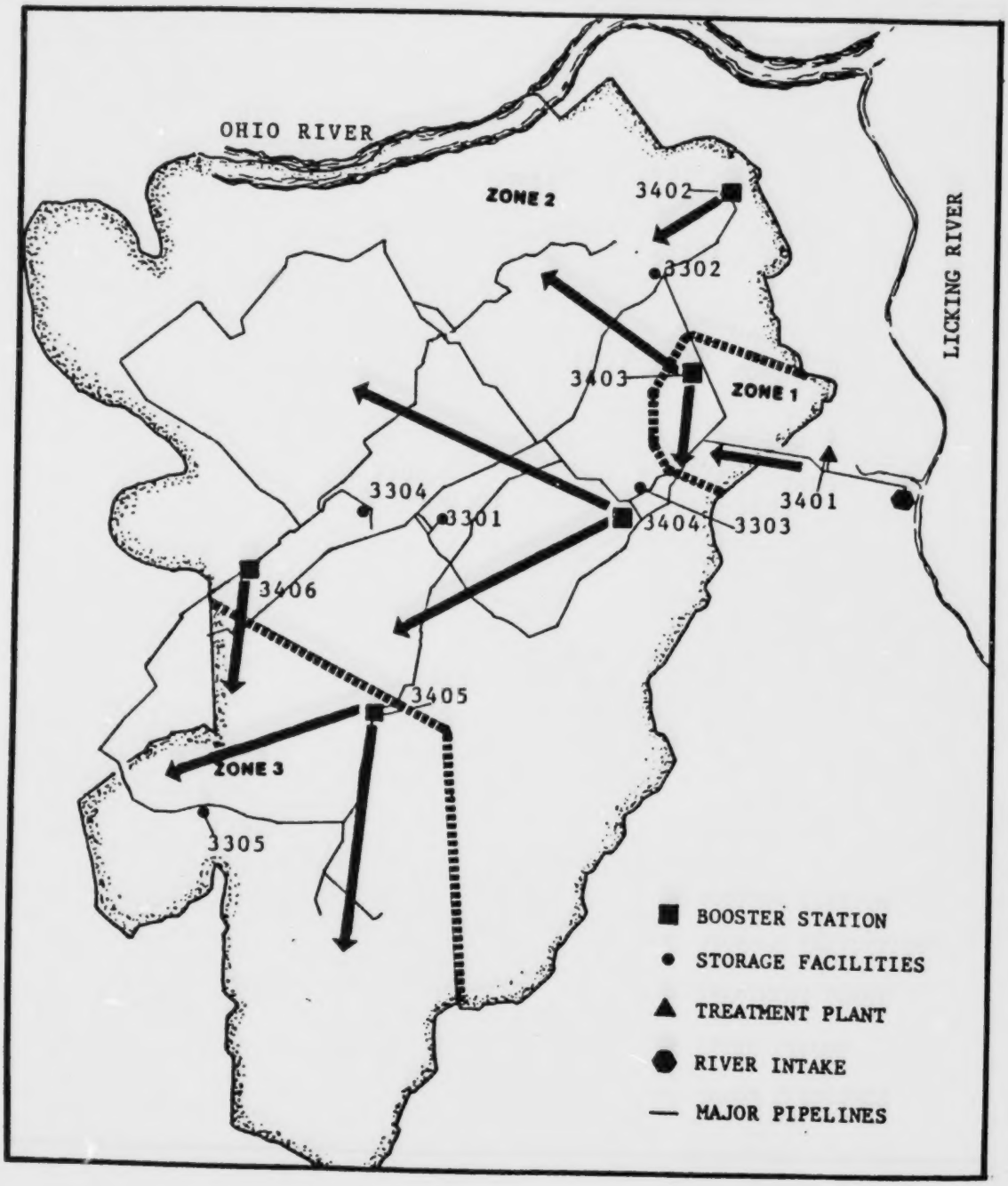

Figure 3. Kenton County Water District No. 1 service area.

DATE: DECEMBER 31, 1980

LEVEL IV REPORT OF
ACQUISITION COSTS FOR
KENTON COUNTY KENTUCKY

COST CATEGORY DESCRIPTIONS		ACQUISITION			
		RIVER	TRANSMISSION	PUMP STATION	PURCHASED WATER
OPER SUPERVISION	CURRENT	46.00			
	YTD	460.00		12.88	
OPER ENGINEERING	CURRENT				
	YTD				
OPER ENGINEERING	CURRENT				
OTHER EXPENSES	YTD				
OPERATION LABOR	CURRENT	166.32			
	YTD	1843.66		65.96	
OPERATION -	CURRENT				
OTHER EXP	YTD				
WATER PURCHASED	CURRENT				
	YTD				
BUILDING SERVICES	CURRENT				
	YTD				
GROUNDS MAINTENANCE	CURRENT				
	YTD	146.01		73.49	
OTHER EXPENSES	CURRENT				
	YTD	89.00			
MAINT SUPERVISION	CURRENT	46.00			
	YTD	460.00		3.22	
MAINT ENGINEERING	CURRENT				
	YTD				
MAINT ENGINEERING	CURRENT				
OTHER EXPENSES	YTD				
MAINT STRUCT &	CURRENT				
IMPROVEMENTS - LABOR	YTD				
MAINT STRUCT &	CURRENT			7.20	
IMPROV - OTHER EXP	YTD	28.70		201.50	
MAINT OF RIVER	CURRENT				
INTAKE - LABOR	YTD	136.61			
MAINT OF RIVER	CURRENT				
INTAKE - OTHER EXP	YTD	2.15			
MAINT OF SUPPLY	CURRENT				
MAINS - LABOR	YTD				

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Figure 4. Level IV report - detail of costs by cost center.

Figure 4 presents a portion of the acquisition function for KCWD as an illustration of the Level IV report. However, separate reports are programmed in the system for each utility function: acquisition, treatment, delivery, and support services. Each report contains cost data relative to its particular functional title. For example, all acquisition costs would be printed in the report title "Acquisition Cost."

All operating and maintenance costs, excluding interest and real property taxes, are included in the Level IV report. The descriptions of the cost categories represent the current chart of accounts, which are based on the recommendations of the National Association of Regulatory Utility Commissioners (NARUC) used by the KCWD. For example, Operation Supervision is a general ledger account in the O&M fund used to record costs for source of supply, pumping, water treatment, transmission and distribution, and customer accounts.

In the Figure 4 example, all dollars charged to the Licking River intake structure through the Operation Supervision account will appear in the matrix intersection of the first row and the first column. Total dollars expended through the Operation Supervision account chargeable to the transmission line connecting the Licking River intake structure and the KCWD treatment plant are shown at the intersection of the first row and the second column. The total of any row will give the total dollars expended for that general ledger cost account. The totals of the columns represent the total dollars charged to each cost center of the function. Since costs are accumulated at identifiable cost centers within the utility system, all cumulative costs for a particular physical point or cost center can be related to the KCWD service area map shown in Figure 3.

Level III Report - Summary of Costs by Function

Figure 5 is a sample of the Level III report. This report is a summary by month and year to date of the information in the Level IV report. Again, a matrix format is used, with the columns representing the six major cost center classifications (functions): acquisition, treatment, delivery, support services interest, and taxes. Because taxes vary depending on the contractual arrangement of the utility, a subtotal column shows the total cost before taxes.

The rows in the Level III report represent standard cost categories independent of the chart of accounts used by the utility. They are summaries of chart of accounts items. These cost categories are designed to be constant, whereas the nomenclature of general ledger accounts varies from year to year and from utility to utility, making comparisons impractical. The major standard cost areas chosen for this study are as follows: 1 payroll costs, 2 other direct costs, 3 depreciation, and 4 interest and taxes.

In this output, the payroll costs include gross pay and payroll

MONTHLY
ENDING: DECEMBER 31, 1980

LEVEL III SUMMARY OF COST
FOR
KENTON COUNTY KENTUCKY

FUNCTION:		ACQUISITION	TREATMENT	DELIVERY	SUPPORT SERVICES	INTEREST	TOTAL	TAXES	TOTAL WITH TAXES
COST CATEGORY									
PAYROLL COST:									
MANAGEMENT AND SUPERVISION	MONTHLY	92.00	276.00	920.00	1,774.24		3,062.24		3,062.24
	YTD	936.10	4,807.00	11,225.00	17,145.12		34,113.22		34,113.22
OPERATION LABOR	MONTHLY	166.32	5,109.44	1,968.00			7,243.76		7,243.76
	YTD	1,907.62	54,335.61	21,044.35			77,287.58		77,287.58
MAINTENANCE LABOR	MONTHLY	45.56	2,680.87	5,308.66			8,034.89		8,034.89
	YTD	639.59	29,355.88	52,770.41			82,765.88		82,765.88
OTHER LABOR	MONTHLY	0.00	0.00	6,466.65	6,986.82		13,453.47		13,453.47
	YTD	0.00	2,619.55	64,529.88	89,357.63		156,507.06		156,507.06
TOTAL	MONTHLY	303.88	8,066.31	14,663.31	8,761.06		31,794.36		31,794.36
	YTD	3,483.31	91,118.04	149,569.64	106,502.75		350,673.74		350,673.74
BENEFITS	MONTHLY				22,975.07		22,975.07		22,975.07
	YTD				135,772.17		135,772.17		135,772.17
TOTAL PAYROLL COST	MONTHLY	303.88	8,066.31	14,663.31	31,736.13		54,769.43		54,769.43
	YTD	3,483.31	91,118.04	149,569.64	242,274.92		486,445.91		486,445.91
OTHER DIRECT COST:									
MAINTENANCE	MONTHLY	7.20	260.25	7,509.54			7,777.03		7,777.03
	YTD	1,210.18	12,804.53	58,701.71			72,716.42		72,716.42
CHEMICALS	MONTHLY		9,855.40				9,855.40		9,855.40
	YTD		112,466.26				112,466.26		112,466.26
POWER	MONTHLY	5,257.97	602.01	34,503.53			40,363.51		40,363.51
	YTD	67,517.88	7,409.96	445,359.61			520,287.45		520,287.45
MISCELLANEOUS	MONTHLY	40.27	1,623.85	-423.31	1,772.72		3,013.53		3,013.53
	YTD	775.58	19,443.32	1,464.57	108,826.77		130,510.24		130,510.24
TOTAL	MONTHLY	5,305.44	12,341.51	41,589.76	1,772.72		61,009.47		61,009.47
	YTD	69,503.64	152,124.07	505,525.89	108,826.77		835,980.37		835,980.37

Figure 5. Level III report - summary of costs by function.

MONTHLY
ENDING: DECEMBER 31, 1980

LEVEL III SUMMARY OF COST
FOR
KENTON COUNTY KENTUCKY

FUNCTION:		ACQUISITION	TREATMENT	DELIVERY	SUPPORT SERVICES	INTEREST	TOTAL	TAXES	TOTAL WITH TAXES
COST CATEGORY									
TOTAL PAYROLL AND OTHER DIRECT COSTS	MONTHLY	5,609.12	20,407.86	56,253.07	33,508.85		115,778.90		115,778.90
	YTD	72,986.95	243,242.11	855,095.53	351,101.65		1,322,426.24		1,322,426.24
DEPRECIATION	MONTHLY	536.91	2,723.58	14,948.79	1,560.83		19,770.11		19,770.11
	YTD	6,442.92	32,682.96	179,385.48	18,729.96		237,241.32		237,241.32
TOTAL	MONTHLY	6,146.03	23,131.44	71,201.86	35,069.68		135,549.01		135,549.01
	YTD	79,429.87	275,925.07	834,481.01	369,831.65		1,559,667.60		1,559,667.60
INTEREST	MONTHLY					1,956.15	1,956.15		1,956.15
	YTD					10,428.46	10,428.46		10,428.46
TAXES	MONTHLY							0.00	0.00
	YTD							0.00	0.00
TOTAL	MONTHLY	6,146.03	23,131.44	71,201.86	35,069.68	1,956.15	137,505.16	0.00	137,505.16
	YTD	79,429.87	275,925.07	834,481.01	369,831.65	10,428.46	1,570,096.06	0.00	1,570,096.06

Figure 5. (continued)

benefits only. All nonlabor costs are listed as other direct costs. Payroll costs comprise the following subclassifications:

a. Management and supervision - Gross pay for all managers and supervisors of all divisions, including operations, maintenance, and support services.

b. Operations labor - Gross pay to personnel operating the facilities identified with the functions of acquisition, treatment, or delivery.

c. Maintenance labor - Gross pay to personnel for maintaining the facilities identified with the functions of acquisition, treatment, or delivery.

d. Other labor - Gross pay to all persons not included in the three labor categories previously defined; for example, meter readers and secretarial employees.

e. Benefits - Costs of employee benefits, such as contributions to social security taxes, pension plans, and health insurance.

Other direct costs comprise all nonlabor costs before depreciation, interest, and taxes. The following subcategories are included:

a. Maintenance - All nonlabor costs involved in maintaining facilities identified with acquisition, treatment, or delivery, including the cost of materials and all other nonlabor cost incidental to maintenance labor.

b. Chemicals - The cost of chemicals used in the treatment process.

c. Power - The cost of power or fuel used to pump or treat water, excluding the costs of lighting and heating.

e. Miscellaneous - All other direct nonlabor costs not included in one of the above subcategories.

Depreciation is an element of the cost; therefore, an annual depreciation base by cost center was determined, with the system charging each cost center one-twelfth of its annual depreciation.

Interest and taxes include all interest charges and taxes required to operate and maintain the facilities. These costs are displayed as a type of cost center (column) and are summarized by account type (row).

Level II Report - Cost Comparison

The Level II report is shown in Figure 6. This report compares the actual costs incurred with two standards: the budgeted costs and the prior year cost.

COST COMPARISON REPORT

LAST ENTRY: DECEMBER 31, 1980 — FOR — PAGE: 4

APJ PERIOD: MONTHLY (4 WKS) — KENTON COUNTY KENTUCKY

YTD START: JANUARY 1, 1980 — (LEVEL II)

COMPARISON OF ACTUAL COST TO BUDGET COST-D

BUDGET CATEGORIES		ACTUAL COSTS		BUDGETED COSTS		VARIANCE YEAR TO DATE		
ACCT #	ACCOUNT NAME	CURR PERIOD	YR TO DATE	YR TO DATE	ANNUAL APJ	BALANCE	PERCENT	
905-13	UTILITIES	59.76	683.74	800.00	800.00	116.26	85.5	
905-35	SAFETY		28.30	50.00	50.00	21.70	56.6	
905-50	OTHER EXPENSES		.46	250.00	250.00	249.54	.2	
905-51	INTEREST EXPENSE DEPOSIT GUARANTEE	362.80	4,511.44	13,000.00	13,000.00	8,488.56	34.7	
ADMINISTRATIVE AND GENERAL								
920-01	OPER SUPERVN & MANAGEMENT	1,669.36	18,596.24	21,500.00	21,500.00	2,903.76	86.5	
920-02	FINANCIAL ACCOUNTING PROGRAM-LABOR	1,331.36	23,339.88	10,000.00	10,000.00	-13,339.88	233.4	*
920-50	FINANCIAL ACCOUNTING PROGRAM-OTHER		170.00	200.00	200.00	30.00	85.0	
921-03	BUILDING SERVICES	177.50	2,573.43	2,500.00	2,500.00	-73.43	102.9	*
921-04	COMMUNICATIONS	-215.81	1,090.66	1,250.00	1,250.00	159.34	87.2	
921-13	UTILITIES	59.76	737.14	750.00	750.00	12.86	98.3	
921-15	OFFICE SUPPLIES	88.31	604.00	500.00	500.00	-104.00	120.8	*
921-20	AUTO MAINTENANCE	5.00	934.72	350.00	350.00	-584.72	267.1	*
921-22	AUTO GAS & OIL	101.02	847.39	400.00	400.00	-447.39	211.8	*
921-28	DUES & SUBSCRIPTIONS		508.21	500.00	500.00	-8.21	101.6	*
921-29	TRAVEL	806.80	1,804.39	1,000.00	1,000.00	-804.39	180.4	*
921-50	OTHER EXPENSES		9.00	50.00	50.00	41.00	18.0	
923-00	PROFESSIONAL FEES	175.00	6,933.87	15,000.00	15,000.00	8,066.13	46.2	
924-00	PROPERTY INSURANCE		11,425.50	12,500.00	12,500.00	1,074.50	91.4	
925-00	INJURIES & DAMAGES	-2,083.31	38,364.82	27,500.00	27,500.00	-10,864.82	139.5	*
926-00	EMPLOYEE PENSIONS & BENEFITS	19,427.38	102,281.20	105,000.00	105,000.00	2,718.80	97.4	
926-21	FICA	3,139.12	31,901.62	27,500.00	27,500.00	-4,401.62	116.0	*
926-22	STATE UNEMPLOYMENT TAX	87.97	1,983.99	1,750.00	1,750.00	-233.99	113.4	*
926-23	PAYROLL TAXES - CITY	408.61	1,589.35	2,500.00	2,500.00	910.65	63.6	
926-50	UBC EXPENSE			100.00	100.00	100.00		
930-00	MISCELLANEOUS GENERAL EXPENSES			250.00	250.00	250.00		
930-50	OTHER EXPENSES		1,447.41	2,000.00	2,000.00	552.59	72.4	
932-39	MAINT OF BUILDING	66.00	191.49	2,500.00	2,500.00	2,308.51	7.7	
932-40	MAINT EQUIPMENT		737.97	1,250.00	1,250.00	512.03	59.0	
932-50	OTHER EXPENSES			150.00	150.00	150.00		
TOTAL ACTUAL COSTS TO BUDGET		119,386.35	1,368,726.05	1,211,265.00	1,211,265.00	-157,461.05	113.0	*
NON BUDGETED COSTS								
933-50	MAINT EQUIPMENT - OTHER EXPENSES							
680-30	EQUIPMENT EXP CR (Cr)	-2,392.50	-33,193.00					
680-31	OVERHEAD EXP CR (Cr)	-1,214.95	-13,106.77					
TOTAL		115,778.90	1,322,426.28	1,211,265.00	1,211,265.00	-111,161.28	109.2	*
DEPRECIATION		19,770.11	237,241.32					
TOTAL		135,549.01	1,559,667.60	1,211,265.00	1,211,265.00	-348,402.60	128.8	*
INTEREST		1,956.15	10,428.46					
TAXES								
TOTAL		137,505.16	1,570,096.06	1,211,265.00	1,211,265.00	-358,831.06	129.6	*

Figure 6. Level II report - cost comparison.

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COST COMPARISON REPORT

LAST ENTRY: DECEMBER 31, 1980 — FOR — PAGE: 5

RPT PERIOD: MONTHLY (4 WKS) — KENTON COUNTY KENTUCKY

YTD START: JANUARY 1, 1980 — (LEVEL II)

COMPARISON OF ACTUAL COST TO PRIOR YEAR

COST CATEGORIES	ACTUAL COSTS CURRENT YEAR (YTD)	ACTUAL COSTS PREVIOUS YEAR (YTD)	VARIANCE YR TO DATE BALANCE	VARIANCE YR TO DATE PERCENT	
ACQUISITION					
PAYROLL COSTS:					
MANAGEMENT & SUPRV	936.10	795.40	-140.70	117.7	*
OPERATION LABOR	1,907.62	1,879.46	-28.16	101.5	*
MAINTENANCE LABOR	639.59	1,030.77	391.18	62.0	
OTHER LABOR		49.77	49.77		
BENEFITS					
OTHER DIRECT COSTS:					
MAINTENANCE	1,210.18	4,123.40	2,913.22	29.3	
CHEMICALS					
POWER	67,517.88	57,775.71	-9,742.17	116.9	*
MISCELLANEOUS	775.58	1,065.37	289.79	72.8	
DEPRECIATION	6,442.92	6,442.92		100.0	
TOTAL COST OF ACQUISITION	79,429.87	73,162.80	-6,267.07	108.6	*
TREATMENT					
PAYROLL COSTS:					
MANAGEMENT & SUPRV	4,807.00	4,173.80	-633.20	115.2	*
OPERATION LABOR	54,335.61	47,707.40	-6,628.21	113.9	*
MAINTENANCE LABOR	29,355.88	17,155.00	-12,200.88	171.1	*
OTHER LABOR	2,619.55	2,022.35	-597.20	129.5	*
BENEFITS					
OTHER DIRECT COSTS:					
MAINTENANCE	12,804.53	9,322.13	-3,482.40	137.4	*
CHEMICALS	112,466.26	109,349.77	-3,116.49	102.8	*
POWER	7,409.96	31,307.14	23,897.18	23.7	
MISCELLANEOUS	19,443.32	15,379.36	-4,063.96	126.4	*
DEPRECIATION	32,682.96	32,682.96		100.0	
TOTAL COST OF TREATMENT	275,925.07	269,099.91	-6,825.16	102.5	*
DELIVERY					
PAYROLL COSTS:					
MANAGEMENT & SUPRV	11,225.00	11,039.45	-185.55	101.7	*
OPERATION LABOR	21,044.35	18,863.22	-2,181.13	111.6	*
MAINTENANCE LABOR	52,770.41	49,290.59	-3,479.82	107.1	*
OTHER LABOR	64,529.88	52,986.13	-11,543.75	121.8	*
BENEFITS					
OTHER DIRECT COSTS:					
MAINTENANCE	58,701.71	52,631.80	-6,069.91	111.5	*

Figure 6. (continued)

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In Figure 6, showing the comparison of actual to budgeted costs, six columns of numbers are printed. The first two columns show actual costs for the current period and year to date. The second two columns reflect the budget by year to date and annual amount. The budgeted year-to-date amount represents the annual budget prorated for the number of months expired. The fifth and sixth columns show the variance of actual cost to budgeted cost as a balance and as a percent.

In the comparison of actual costs to budget, the rows of costs coincide with the general ledger chart of accounts because the utility normally establishes its budget by general ledger account. The total actual cost, budget, and variance are displayed first for the budgeted accounts; net cost incurred for nonbudgeted general ledger accounts are printed below, along with total balance. Budget and variances are then given for depreciation, interest, and taxes, and on the last line, a final total balance is shown. The second section of the Level II output, also shown in Figure 6, compares current year-to-date costs with previous year-to-date costs. The rows represent the standard cost categories used in the Level III output because they constitute a standard reference for use in this comparison. The comparison is made for each of the six major cost functions, showing variance as a balance and as a percent.

Level I Report - Summary of Systems Information

The Level I standard report illustrated in Figure 7 contains summary information from the accumulated cost data plus additional data intended to supply information for evaluation of the overall operation of the utility. From the matrix format, a correlation can be made between costs and operations. The columns represent the six major cost center functions, plus a subtotal before taxes and a final total after taxes.

The first five rows of Figure 7 contain cost data expressed as $/MG of RPW for the following: 1 current period, current year; 2 previous period, current year; 3 current period, previous year; 4 year to date, current year; and 5 year to date, previous year. These unit costs are compared in this way to facilitate a trend analysis.

The next two rows contain the total costs for the current period and year to date. These totals agree with the totals of the Level III and Level II reports by function and grand total. From the Level II report, the total budget variance is then printed as a percent of actual expenditure compared to the budget.

The next four rows contain data on water flow as follows: 1 treated water, current period; 2 RPW, current period; 3 RPW, year to date; and 4 RPW, previous year to date.

Finally, the Level I report gives the percentage of total cost

DATE: DECEMBER 31, 1980

SUMMARY OF SYSTEMS INFORMATION
FOR
KENTON COUNTY KENTUCKY
(LEVEL I)

PAGE: 1

CATEGORY	ACQUISITION	TREATMENT	DELIVERY	SUPPORT	INTEREST	TOTAL	TAXES	TOTAL
CURRENT PERIOD UNIT COST $/MG	25.22	98.90	292.12	143.88	8.03	564.15		564.15
PREVIOUS PERIOD UNIT COST $/MG	28.02	90.54	284.32	88.94	3.02	494.84		494.84
CURRENT PERIOD PREVIOUS YEAR $/MG	28.24	78.77	253.78	126.89	5.16	492.86		492.86
CURRENT YEAR (YTD) UNIT COST $/MG	25.80	89.64	271.10	120.15	3.39	510.08		510.08
PREVIOUS YEAR (YTD) UNIT COST $/MG	25.06	92.19	238.82	112.99	19.88	488.94		488.94
CURRENT PERIOD TOTAL COST	6146.03	23131.44	71201.86	35069.68	1956.15	137505.16		137505.16
YEAR TO DATE TOTAL COST	79429.87	275925.07	834481.01	369831.65	10428.46	1570096.06		1570096.06
% OF TOTAL YEAR TO DATE	5.06	17.57	53.15	23.55	.66			100.00
% OF PREVIOUS YEAR (YTD)	5.13	18.85	48.84	23.11	4.07			100.00
BUDGET VARIANCE YEAR TO DATE								113.80
TREATED WATER CURRENT PERIOD								265.51
REVENUE PRODUCING WATER CURRENT PERIOD								243.74
REVENUE PRODUCING WATER (YTD)								3078.15
REVENUE PRODUCING WATER PREVIOUS YTD								2919.08

Figure 7. Level I report - summary of systems information.

chargeable to each function for the current year to date and the previous year to date. This provides an indication of shifts in cost and of trends in areas where expenses are increasing.

CONCEPT OF THE COST CODING SYSTEM

The cost coding system, which includes the chart of account numbers for the financial reporting system and the special code required for MARS, is shown in Figure 8. The first group of numbers (XXX-XX) designates the general ledger expense accounts. This five-digit number conforms in general to the NARUC chart of accounts.

The second group of numbers (YYYY) identifies the cost centers that generate the expense. As shown in Figure 8, the first digit of the cost center number identifies the function, the second digit identifies the subfunction, and the last two digits identify the unit. The subfunction (second digit) and identification (third and fourth digits) appear only in the Level IV report.

The lower left-hand portion of Figure 8 illustrates the function of the first two groups of numbers in producing the Level IV report, detailing all costs by general ledger accounts description and cost center. The rows represent the general ledger accounts; the columns identify the three levels of cost centers.

The third group of numbers (ZZ), as illustrated in the upper portion of Figure 8, is a two-digit series corresponding to the 12 standard cost categories used in the Level III summary reports.

COST ALLOCATION CONCEPT

MARS can only fulfill its function when all cost data are charged to the appropriate cost centers. This is accomplished by the correct cost center being identified when the data are entered on the source document; i.e., payroll time card, requisition from stock form, etc. Exceptions to this procedure will occur when the cost center information is not obtained or when a general cost cannot be identified to a specific center. To deal with such exceptions, an allocation concept assigns costs to appropriate cost centers.

Four basic methods of allocating costs to cost centers are defined and described below:

a. Cost Allocation Code A - Using Code A, all costs charged to a particular general ledger account but lacking cost center identification will always be charged to a single predesignated cost center.

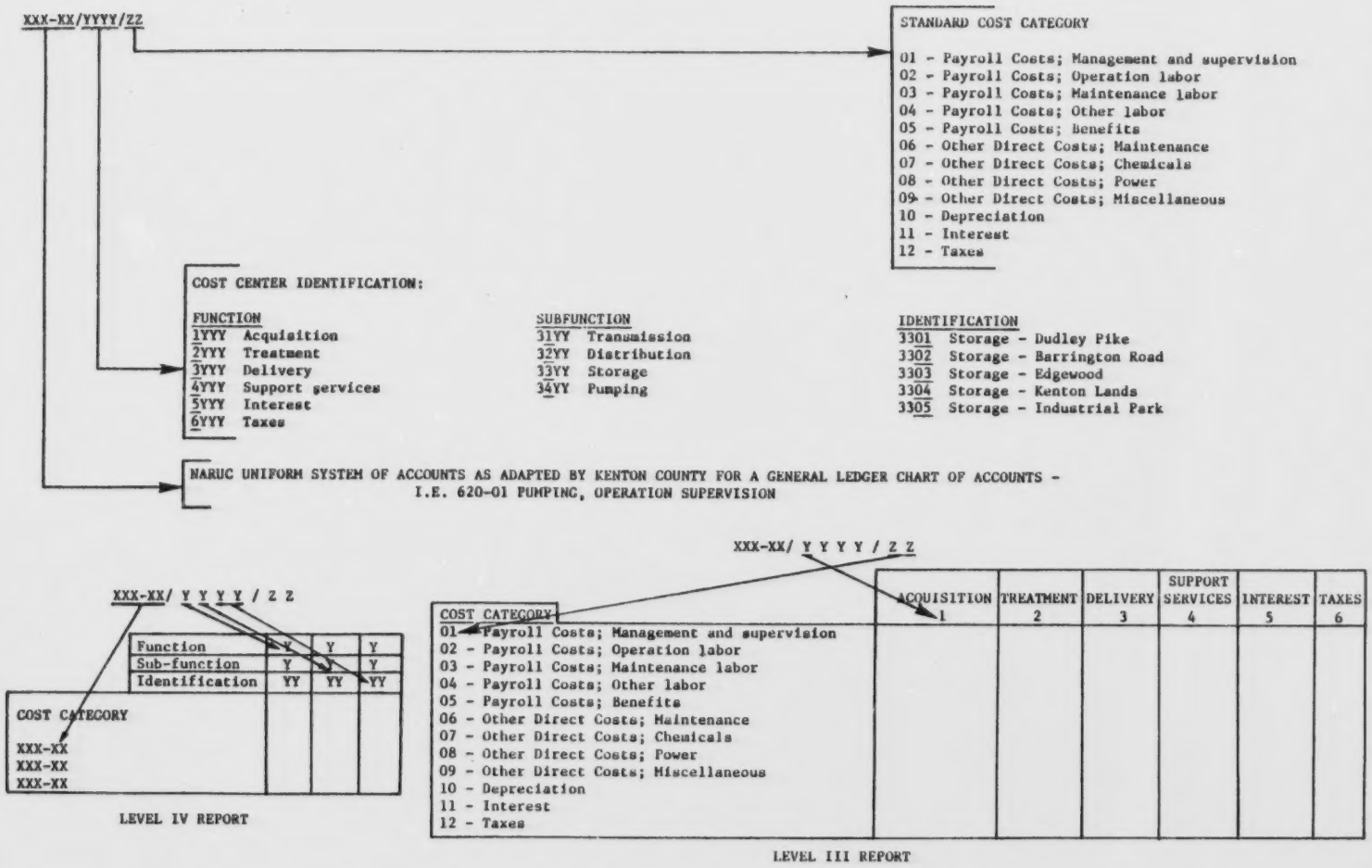

XXX-XX/YYYY/ZZ
STANDARD COST CATEGORY
01 - Payroll Costs; Management and supervision
02 - Payroll Costs; Operation labor
03 - Payroll Costs; Maintenance labor
04 - Payroll Costs; Other labor
05 - Payroll Costs; Benefits
06 - Other Direct Costs; Maintenance
07 - Other Direct Costs; Chemicals
08 - Other Direct Costs; Power
09 - Other Direct Costs; Miscellaneous
10 - Depreciation
11 - Interest
12 - Taxes
COST CENTER IDENTIFICATION:
FUNCTION
1YYY Acquisition
2YYY Treatment
3YYY Delivery
4YYY Support services
5YYY Interest
6YYY Taxes
SUBFUNCTION
31YY Transmission
32YY Distribution
33YY Storage
34YY Pumping
IDENTIFICATION
3301 Storage - Dudley Pike
3302 Storage - Barrington Road
3303 Storage - Edgewood
3304 Storage - Kenton Lands
3305 Storage - Industrial Park
NARUC UNIFORM SYSTEM OF ACCOUNTS AS ADAPTED BY KENTON COUNTY FOR A GENERAL LEDGER CHART OF ACCOUNTS -
I.E. 620-01 PUMPING, OPERATION SUPERVISION
XXX-XX/ Y Y Y Y / Z Z
Function Y Y Y
Sub-function Y Y Y
Identification YY YY YY
COST CATEGORY
XXX-XX
XXX-XX
XXX-XX
LEVEL IV REPORT
XXX-XX/ Y Y Y Y / Z Z
COST CATEGORY
01 - Payroll Costs; Management and supervision
02 - Payroll Costs; Operation labor
03 - Payroll Costs; Maintenance labor
04 - Payroll Costs; Other labor
05 - Payroll Costs; Benefits
06 - Other Direct Costs; Maintenance
07 - Other Direct Costs; Chemicals
08 - Other Direct Costs; Power
09 - Other Direct Costs; Miscellaneous
10 - Depreciation
11 - Interest
12 - Taxes
ACQUISITION 1
TREATMENT 2
DELIVERY 3
SUPPORT SERVICES 4
INTEREST 5
TAXES 6
LEVEL III REPORT

Figure 8. Cost classification system.

b. Cost Allocation Code B - Under Code B, all indirect costs will be allocated to cost centers based on the ratio of direct costs charged to the cost centers from source documents.

c. Cost Allocation Code C - This code will allocate cost to designated cost centers based on a fixed multiplier.

d. Cost Allocation Code D - This code is similar to Code A except that the direct costs shown on the source document will be recognized by the system and will override the single cost center programmed previously.

SECTION 3

DESCRIPTION OF TAMPA UTILITIES

Following are descriptions of the City of Tampa's Sanitary Sewer Department and Water Department and of their financial reporting system.

SANITARY SEWER DEPARTMENT

The City of Tampa, Florida, Sanitary Sewer Department provides the service of wastewater collection and treatment to citizens and industry located in the City of Tampa and in nearby unincorporated areas. The retail service area includes metropolitan Tampa with a population of nearly 300,000 in 1979. Population trends in recent years have shown a steady increase with continued emphasis on industrial expansion.

Wastewater Service Area

The City of Tampa Sanitary Sewer Department provides sewer service on a retail basis to all classes of customers within the service area shown in Figure 9. Although not included in the jurisdiction of the wastewater service area, the City of Temple Terrace generates flow to an intercept located in the southwestern corner of Temple Terrace near the Hillsborough River. Service is also provided to the incorporated City of Brandon and to developed areas of Egypt Lake and the University of South Florida.

The service area of the Sanitary Sewer Department covers over 167 square miles, and serves over 80,000 accounts within a network of 1,400 miles of pipe. Elevations in the service area vary between 5 and 50 feet above sea level.

Organization

The responsibility for collection and treatment of all sewage generated within the service area rests with the City's Sanitary Sewer Department. All collection and treatment facilities are owned, operated, and maintained by this Department. Wastewater structures are constructed from general revenues collected by the City, federal assistance grants, and by the acquisition of facilities from subdivision developers who have designed and built the structures and then transferred possession to the City of Tampa for operation and maintenance.

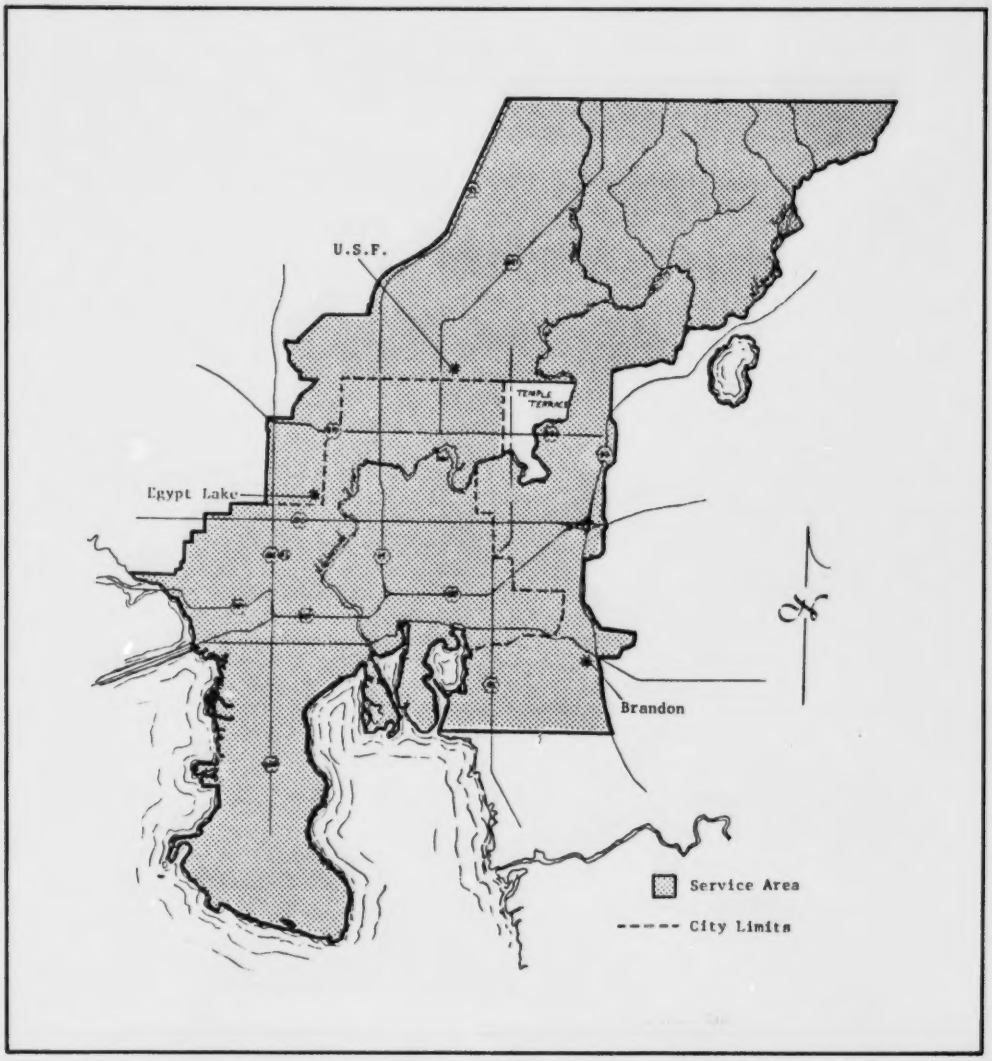


Figure 9. City of Tampa Sanitary Sewer service area map.

The Department, consisting of over 300 full-time employees, is managed by a director who reports directly to the Administrator of Water Resources and Public Works. The Department is comprised of four divisions: the Administration Division, which includes customer service and accounting; the Engineering Division, which includes planning, design, and inspection and survey; the Treatment Division, which includes pump stations, maintenance, and other operations; and the General Maintenance and Construction Division, which is primarily responsible for construction and repair of pipe in the ground. The organizational chart is shown in Figure 10.

Collection

The City of Tampa Sanitary Sewer Department draws sewage from its service area by a system of 130 pump stations and ejector stations with some gravity-assisted flow lines between pump facilities.

The collection and transmission system consists of over 1400 miles of pipe, ranging from 12 to 60 inches in diameter for the gravity system, and including a number of 4-inch force mains. Wastewater is metered only at major intercept pumping stations and at the intake junction to the wastewater treatment facilities.

Treatment

Generally, all wastewater generated in the City of Tampa is processed through a single treatment plant at Hooker's Point, with some flow receiving various levels of treatment at several locations before it is discharged into the collection system. Certain major industrial users produce a quantity of wastewater which, due to its characteristic quality, would overload the system. Three such users within the City of Tampa have constructed pretreatment facilities to process the wastewater before it enters the Tampa sewer system. These plants are the Woodcrest, Juanita, and National Gypsum treatment plants. In addition, several apartment complex and multiple-residence developments have package plants which, although serving a treatment function, are generally considered as ordinary pump stations by the City of Tampa.

A separate treatment facility was designed and constructed by the City of Tampa at the request of the University of South Florida (USF), who contributed nearly $3 million toward the facility. Although the wastewater facility treats all sewage generated from the University of South Florida, the plant was also designed and built for the convenience of residential development in that area. This satellite treatment plant is considered an interim measure by the City of Tampa, which has the responsibility for its operation and maintenance expense. The USF plant is a secondary treatment facility, utilizing activated sludge and treating an average flow of 1.1 MGD in 1979. This flow represents 2 percent of the total wastewater within the Tampa system.

Although connected to the collection system, the USF plant in 1979

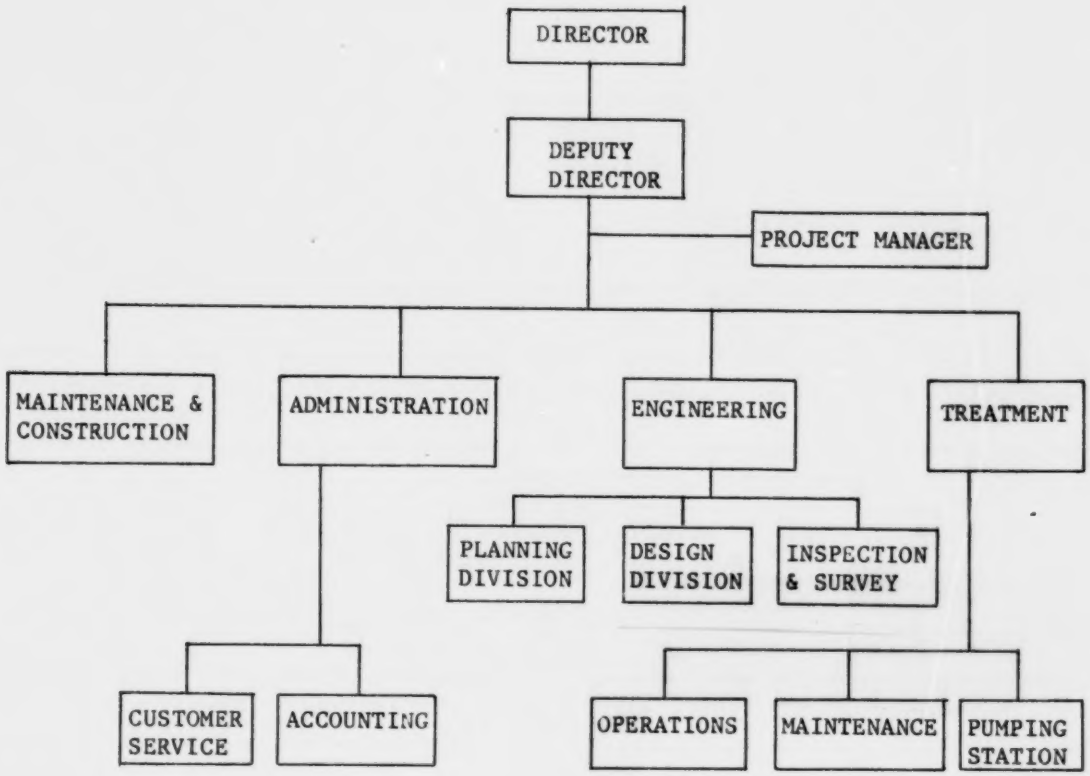


Figure 10. Tampa Sanitary Sewer Department organizational chart.

disposed of its treated wastewater by means of land application. Diffusers irrigate the treated effluent over several acres owned by the University south of Fowler Avenue between 30th and 50th Streets. Waste sludge from this facility is disposed of by being pumped into the Tampa sewer system for treatment at the Hooker's Point plant.

Presently, Hooker's Point is the main treatment facility, with a design flow capacity of 60 MGD. This plant, which is an advanced wastewater treatment (AWT) facility, houses the administrative, maintenance, repair, and laboratory facilities. The AWT plant was constructed in 1977 as an addition to the existing primary treatment plant, and has been operational since early 1978, operating 24 hours a day.

The Hooker's Point AWT plant was placed on line in January 1978, at 30 MGD, and by May of that year operated at 100 percent capacity. By January 1, 1979, facilities for denitrification and phosphorous removal were added. In June of that same year a Florida State variance permit was granted to the City of Tampa, eliminating the requirement for phosphorous removal in the effluent to Tampa Bay since the ambient phosphorous levels of the Bay are naturally higher than permit requirements.

The present treatment plant consists of the structures which were once part of a conventional primary treatment facility, and the more recently built structures that form the AWT portion of the plant. The hydraulic flow capacity was reached on May 9, 1979, the same year that construction of the plant was completed, a result of unusually heavy rainfall. Under normal conditions, the older primary treatment section of the facility is operated at capacity (36 MGD), and additional flow is directed through separate lines into the AWT section. Figure 11 is a schematic representation of the treatment process. The older facility consists of screening and grit removal, rapid mix for the addition of flocculent polymer, and primary sedimentation. The rapid mix facility is currently unused.

Effluent from the primary section then enters the AWT facility, while the primary sludge is pumped into five anaerobic digesters. The digested sludge is pumped to sludge drying beds for dewatering.

The AWT facility has a separate screening and grit removal process. The flow then enters a two-stage pure-oxygen activated sludge process, followed by denitrification, post aeration, and chlorination.

A separate facility provides for oxygen generation and storage. The equipment generating this pure oxygen is a cryogenic type with switchover facilities to feed bottled liquid oxygen purchased in 150-pound cylinders that are used for a period of 2 weeks during the year while the oxygen generation equipment is shut down for repair and general maintenance.

The two-stage process consists of a first stage for carbonaceous removal, and a second stage for nitrification.

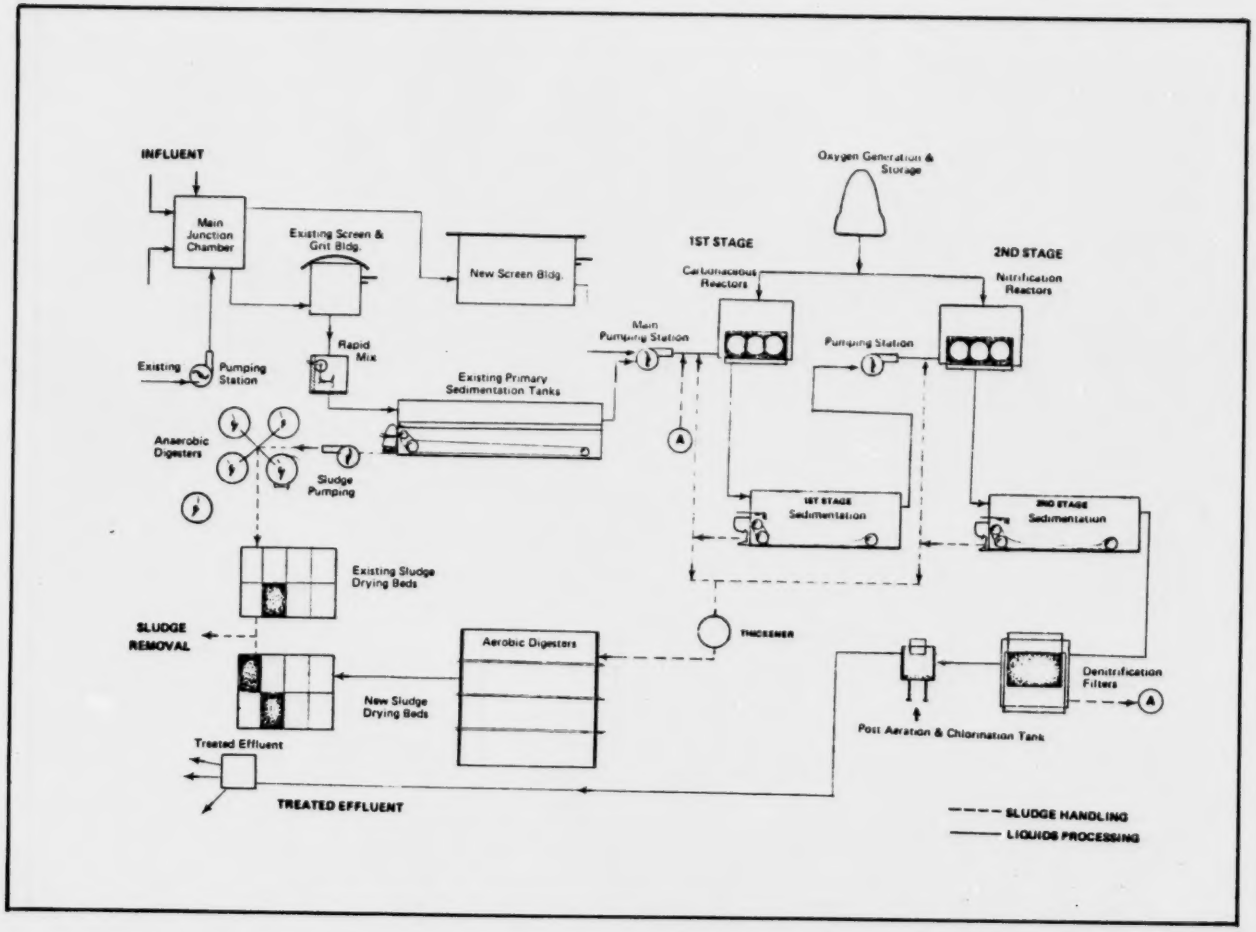


Figure 11. Hooker's Point wastewater treatment plant diagram.

Sludge produced in the AWT facility is aerobically digested. Thickeners are provided before the aerobic digesters. Supernatant from the digesters is returned by gravity to the head of the first stage reactors. Sodium aluminate is added for phosphorous removal. The effluent from the two-stage system then enters biological denitrification filters that use methanol as a supplemental carbon source. The effluent is chlorinated and aerated before it is discharged by gravity stream to Tampa Bay. Backwash from the denitrification filters is recycled to the head of the two-stage system. The first stage of the process operates with a solids retention time (SRT) of from 1.2 to 1.5 days; the second stage operates in the range of 7.5 to 10.5 days SRT. Waste-activated sludge from both stages is treated together. Figure 12 is a flow diagram of the wastewater treatment process used in the Hooker's Point treatment plant.

The City of Tampa has the benefit of a market for its dewatered sludge, which is sold by truckload to local users for agricultural purposes. In addition, methane gas, generated as a by-product of anaerobic digestion is used for power generation. The cost savings in this effort are small because the anaerobic digesters only process a portion of the sludge generated by the facility, with most of the sludge being aerobically digested. The City of Tampa removes sludge from its drying beds and transports it to a holding area for later sale. Treated liquid effluent is removed from the Hooker's Point treatment facility by gravity to Tampa Bay. The waste treatment facility at the University of South Florida removes liquid effluent through a series of diffusers, which spread the liquid effluent on the ground as an irrigation process, and discharges the sludge into the sewer system. No identifiable costs have been provided by the City of Tampa for the low volume of liquid and sludge disposed of in this manner.

WATER DEPARTMENT

The City of Tampa Water Department was established on August 1, 1923, when the City purchased the operations of the Tampa Water Company. At that time, source water came from wells located in the Tampa Heights area of the City. In about 1926, because the quality of the water in the wells was poor, the Department began obtaining its source water from the Hillsborough River. To process the new source of water, a steam pump station and a water treatment plant were constructed adjacent to the river, just above an existing river dam. This plant facility is still in operation and, through improvements and modifications, is capable of producing 90 MGD of treated water.

The amount of RPW in 1977 increased by 29.4 percent from the amount produced in 1968, and population trends in the area have shown a rapid growth in the past 10 years. To serve the increased population, the City completed the Morris Bridge treatment plant and a 20-well field, each well approximately 500 feet deep, producing a maximum of 2 MGD. The treatment

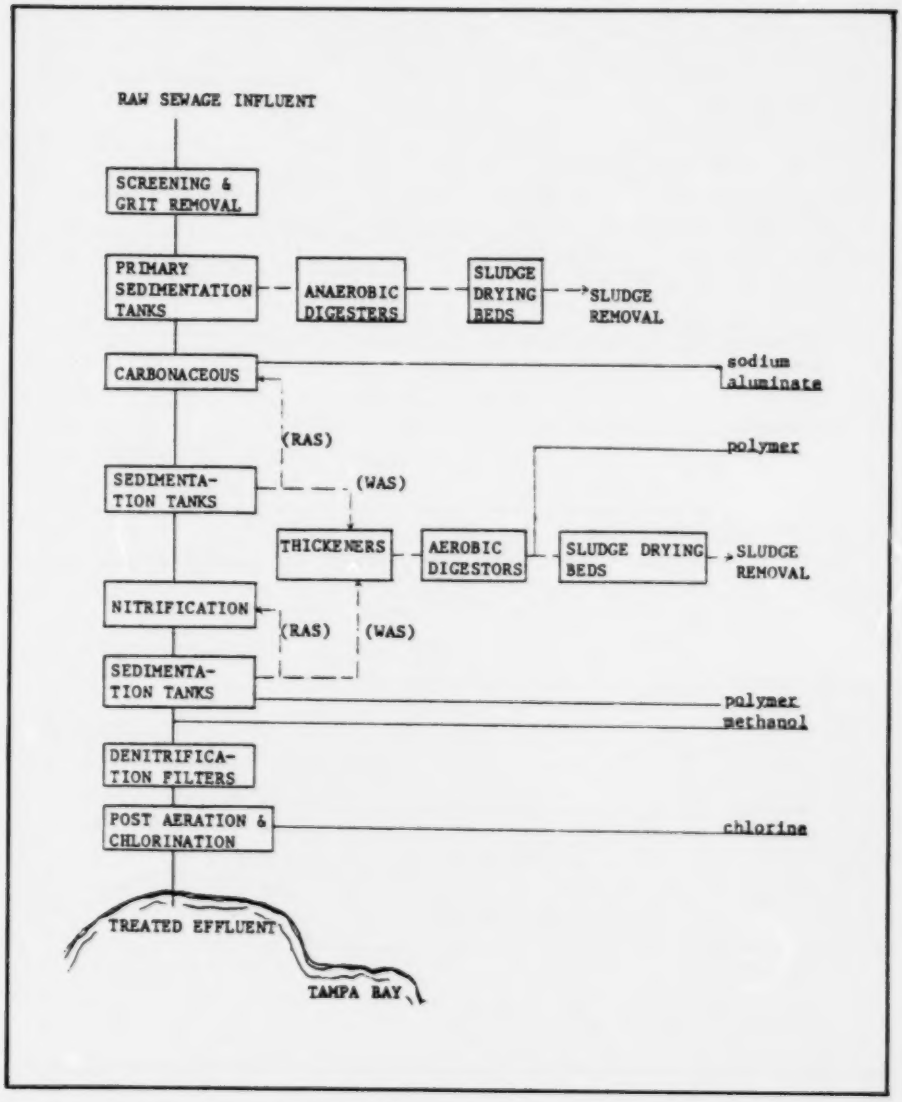


Figure 12. Hooker's Point Wastewater Treatment Plant.

facilities, with a maximum treatment capacity of 40 MGD, assist in providing water during high demand periods. The additional treated water is stored in two 5-million gallon storage tanks and is then transmitted into mains that are tied into the existing delivery system.

Water Supply Service Area

Water is provided on a retail basis to both residential and industrial customers within a service area of 84 square miles. Figure 13 is a map of the service area served by the Tampa Water Department. Over 100,000 metered accounts are served through a network of over 1,800 miles of pipe to a population of approximately 419,500. Elevations in the service area vary between 5 and 50 feet above sea level.

Organization

The Tampa Water Department is a self-supporting department of the City of Tampa and is responsible for the operation and maintenance of the City's water system. The Department, consisting of approximately 250 full-time employees, is managed by a Director who reports directly to the Administrator of Water Resources and Public Works. Four divisions comprise the Department's organization: the Engineering Division, responsible for drafting, engineering and planning; the Administration Division, responsible primarily for the general administration of the organization, the accounting, and other support services; the Distribution Division, responsible for construction and repair; the Production Division, responsible for the operation and maintenance of the laboratory, treatment plant, and pumping. The organizational chart is shown in Figure 14.

Acquisition

The Tampa water system's main source of raw water is the Hillsborough River, which yields a minimum of 30 MGD to a maximum of approximately 2,000 MGD. Water flows from a drainage area of approximately 600 square miles, forming the Hillsborough River basin. A concrete dam constructed on the river creates a reservoir that contains approximately 200 area-feet of river water. During periods of low river flow and high water demand, the river water is supplemented by approximately 20 MGD of water from Sulphur Springs, a natural source pumped into the river reservoir.

About one mile above the dam, water is drawn from the river at an intake chamber and into a suction well near a low-lift pumping station. The low-lift raw water is pumped by five centrifugal pumps, one with a capacity of 21 MGD and two with a capacity of 12.5 MGD each, one with a capacity of 4.6 MGD and one with a capacity of 12.0 MGD. These acquisition pumps move the raw water from the suction wells through independent raw water mains to a valve chamber and into the treatment plant. Part of the pumping is accomplished by the steam-driven pumps. The pump station includes its own steam plant that operates the steam-driven pumps, and electrical generators for emergency electrical power. Conversion from steam to electrical driven pumps is underway and should be completed in 1982.

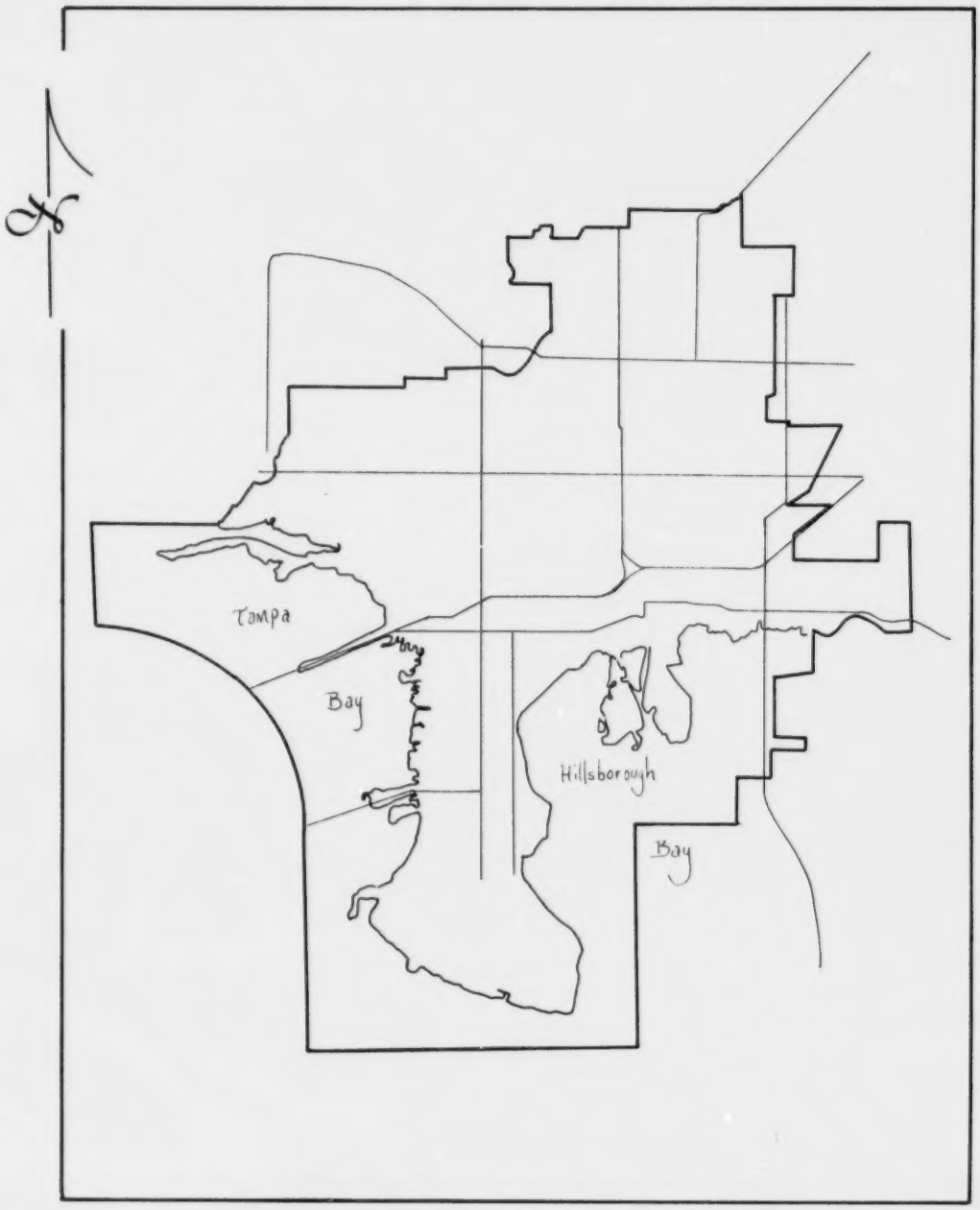


Figure 13. Tampa Water Department service area map.

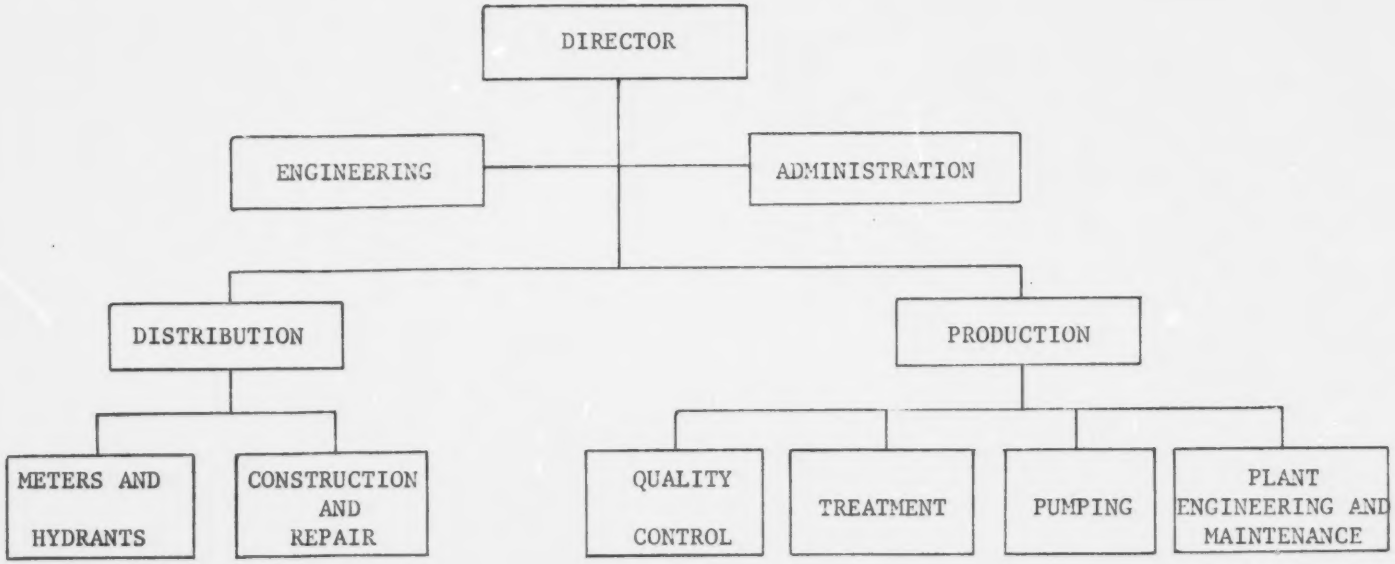


Figure 14. Tampa Water Department organizational chart.

Treatment

The main treatment facility is located near the bank of the Hillsborough River, approximately one mile upstream of the river reservoir dam. The quality of the raw water from the river may vary from low coloration, hard to highly colored, relatively soft. The treatment plant can treat a maximum of 100 MGD during periods of low coloration and a maximum of 75 MGD when the source water is highly colored. Figure 15 is a schematic of the treatment facility. The treatment plant uses conventional chemical pretreatment. In addition, copper sulfate is added to control algae growth and bimetallic phosphate provides corrosion control. The treatment process is one of coagulation, flocculation, sedimentation, chlorination, and filtration.

As raw water flows into the treatment facilities, alum, sodium silicate, and polymers are mixed with the water in a baffled flash-mix unit. For clarification, the water then flows from the flash-mixer into mechanical, slow-mix basins. From that point, the water enters eight settling basins where sludge is collected and moved into sludge drying beds. Next, the water moves into a series of 30 rapid, dual-media filters that contain sand and gravel within a top layer of anthracite coal. Just before the water enters the filtration system, lime and chlorine are added for stabilization and disinfection. The filtration system backwash-water is recovered and recycled back into the system at the slow-mix basins, so that minimum water loss is incurred at the plant. A continual effort is underway to improve treatment and to reduce cost so the chemicals used periodically change. This description is what was used at a specific time.

After filtration, all water is blended in a blending chamber. The finished water is stored in four underground, clearwell reservoirs, with a total storage capacity of 15 million gallons, before being pumped into the delivery system.

A well-equipped laboratory for testing the water quality is located on site at the main treatment plant. Samples of treated water are collected weekly throughout the City. Also, raw water samples from several points along the river are analyzed.

Figure 16 is a flow diagram of the water treatment plant showing the processes and the chemicals that are added to the water.

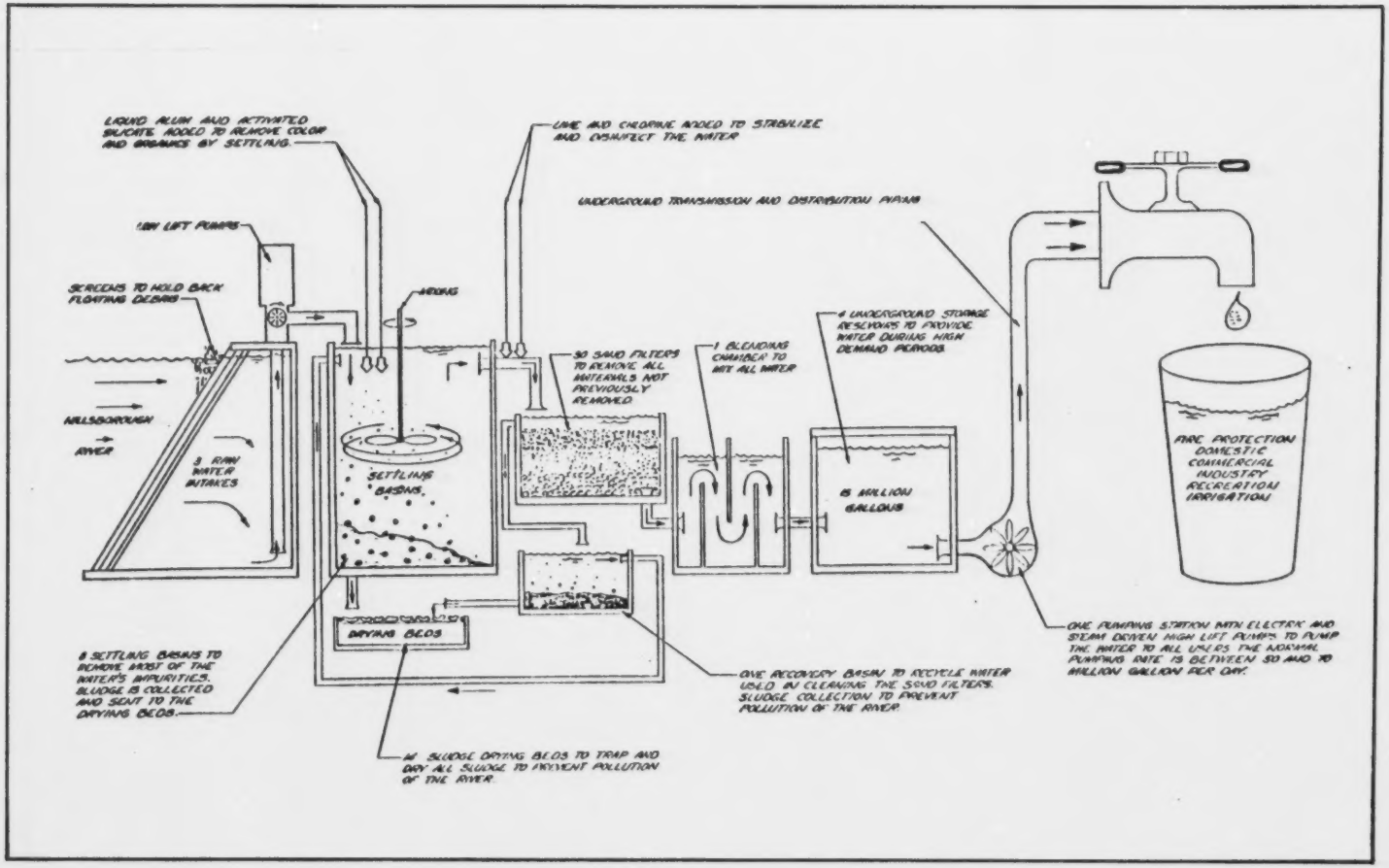

LIQUID ALUM AND ACTIVATED SILICATE ADDED TO REMOVE COLOR AND IMPURITIES BY SETTLING.
LIME AND CHLORINE ADDED TO STABILIZE AND DISINFECT THE WATER
UNDERGROUND TRANSMISSION AND DISTRIBUTION MAINS
LOW LIFT PUMPS
SCREENS TO HOLD BACK FLOATING DEBRIS
MIXING
HILLSBOROUGH
RIVER
3 RAW WATER INTAKES
SETTLING BASINS.
30 SAND FILTERS TO REMOVE ALL IMPURITIES NOT PREVIOUSLY REMOVED.
1 BLENDING CHAMBER TO MIX ALL WATER
4 UNDERGROUND STORAGE RESERVOIRS TO PROVIDE WATER DURING HIGH DEMAND PERIODS.
15 MILLION GALLONS
FIRE PROTECTION DOMESTIC COMMERCIAL INDUSTRY RECREATION IRRIGATION
ONE PUMPING STATION WITH ELECTRIC AND STEAM DRIVEN HIGH LIFT PUMPS TO PUMP THE WATER TO ALL USERS. THE NORMAL PUMPING RATE IS BETWEEN 50 AND 70 MILLION GALLON PER DAY.
8 SETTLING BASINS TO REMOVE MOST OF THE WATER'S IMPURITIES. SLUDGE IS COLLECTED AND SENT TO THE DRYING BEDS.
DRYING BEDS
ONE RECOVERY BASIN TO RECYCLE WATER USED IN CLEANING THE SAND FILTERS. SLUDGE COLLECTION TO PREVENT POLLUTION OF THE RIVER.
14 SLUDGE DRYING BEDS TO TRAP AND DRY ALL SLUDGE TO PREVENT POLLUTION OF THE RIVER.

Figure 15. Tampa Water Department treatment facility diagram.

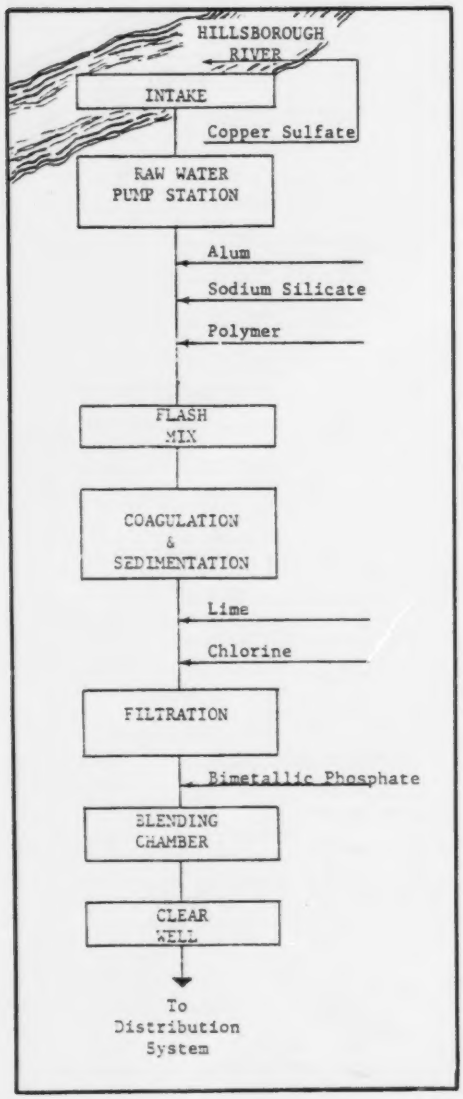


Figure 16. Tampa Water Department treatment diagram.

Delivery

The river pumping stations, which are equipped with both electric and steam-operated pumps, initially draw the raw water from the Hillsborough River reservoir, and pump the water through the main treatment plant and into the clearwell reservoirs. The treated water from the reservoirs is pumped into the delivery system by two 23 MGD and two 12.5 MGD steam-driven centrifugal high-lift pumps in the low-lift pump station, and by a 5 MGD electric centrifugal high-lift pump near the clearwell reservoirs. Within the delivery system, treated water is stored in two ground level storage tanks near the Northwest and the Interbay pumping stations; one tank holds 3 million gallons, the other holds 5 million gallons. These two repumping stations are used to fill the storage tanks with treated water and maintain proper water pressure within the distribution system.

Two elevated storage tanks, West Tampa and Palma Ceia, each with a capacity of 1.5 million gallons, are also located within the delivery system. The elevated storage tanks not only store water, but also assist in maintaining proper pressure.

The transmission and distribution system network consists of over 1,800 miles of pipe, from 2 inches to 54 inches in diameter. The sale of all the treated water is metered.

TAMPA'S FINANCIAL REPORTING SYSTEM (FIN)

OVERVIEW

FIN is the name given the City of Tampa financial reporting system. FIN was developed by Tampa in an attempt to streamline input requirements by using on-line terminals that validate and edit input data as it is entered into the data base files. The objective of FIN is to provide a detailed level of information and also to provide the data requirements to higher levels of management and budgeting. Like most Florida municipal organizations, FIN is based on the State's standardized system of accounts. Each coding element has its unique meaning and identity within the system. It is within this system that the City's books are maintained.

The source data for FIN originates at many different locations, some within a functional department such as the Purchasing Department. Figure 17 shows, generally, source data flow through FIN and some of the output reports provided by the system. FIN coding uses a pyramidal structure whereby a transaction enters at its lowest level and can automatically accumulate data to reflect higher levels of activities. The file layout for FIN is shown in Figure 18. The information in each transaction varies depending on the type of transaction, but all transactions normally share the common key fields that interpret and categorize the data. These fields create the account number and consist of the fund, department,

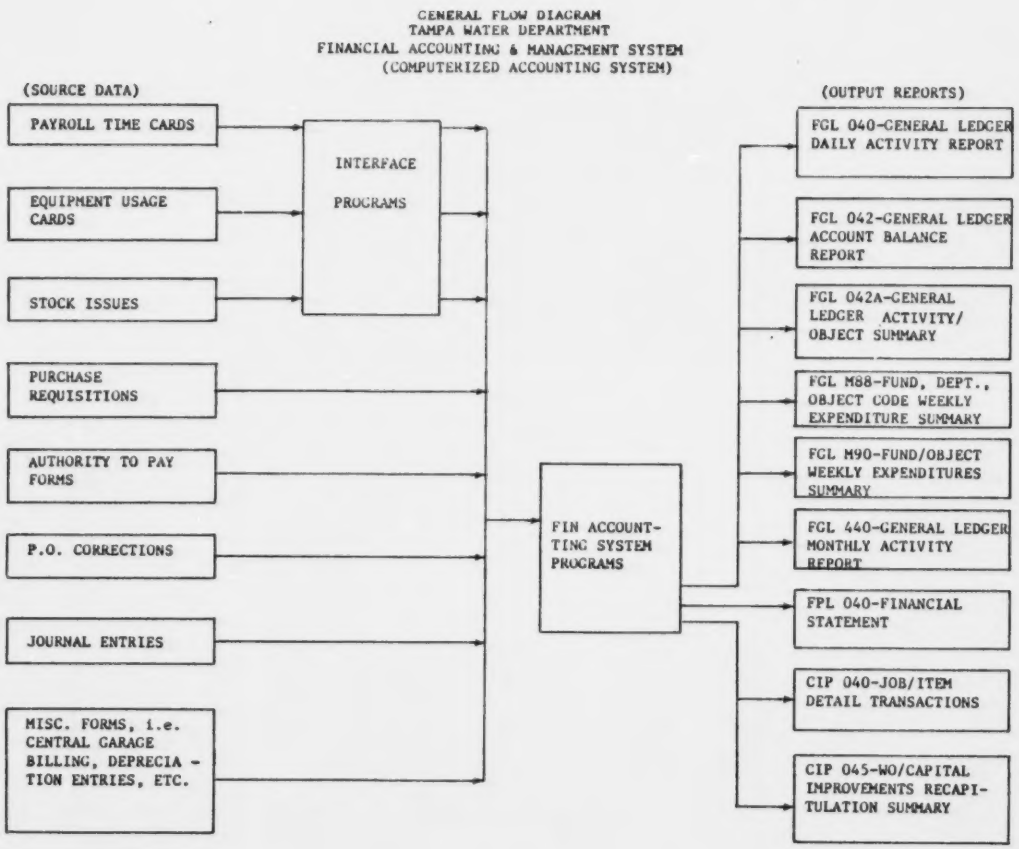

GENERAL FLOW DIAGRAM
TAMPA WATER DEPARTMENT
FINANCIAL ACCOUNTING & MANAGEMENT SYSTEM
(COMPUTERIZED ACCOUNTING SYSTEM)
(SOURCE DATA)
PAYROLL TIME CARDS
EQUIPMENT USAGE CARDS
STOCK ISSUES
PURCHASE REQUISITIONS
AUTHORITY TO PAY FORMS
P.O. CORRECTIONS
JOURNAL ENTRIES
MISC. FORMS, i.e. CENTRAL GARAGE BILLING, DEPRECIA - TION ENTRIES, ETC.
INTERFACE PROGRAMS
FIN ACCOUNT- TING SYSTEM PROGRAMS
(OUTPUT REPORTS)
FGL 040-GENERAL LEDGER DAILY ACTIVITY REPORT
FGL 042-GENERAL LEDGER ACCOUNT BALANCE REPORT
FGL 042A-GENERAL LEDGER ACTIVITY/ OBJECT SUMMARY
FGL M88-FUND, DEPT., OBJECT CODE WEEKLY EXPENDITURE SUMMARY
FGL M90-FUND/OBJECT WEEKLY EXPENDITURES SUMMARY
FGL 440-GENERAL LEDGER MONTHLY ACTIVITY REPORT
FPL 040-FINANCIAL STATEMENT
CIP 040-JOB/ITEM DETAIL TRANSACTIONS
CIP 045-WO/CAPITAL IMPROVEMENTS RECAPI- TULATION SUMMARY

Figure 17.

FIN FILE LAYOUT

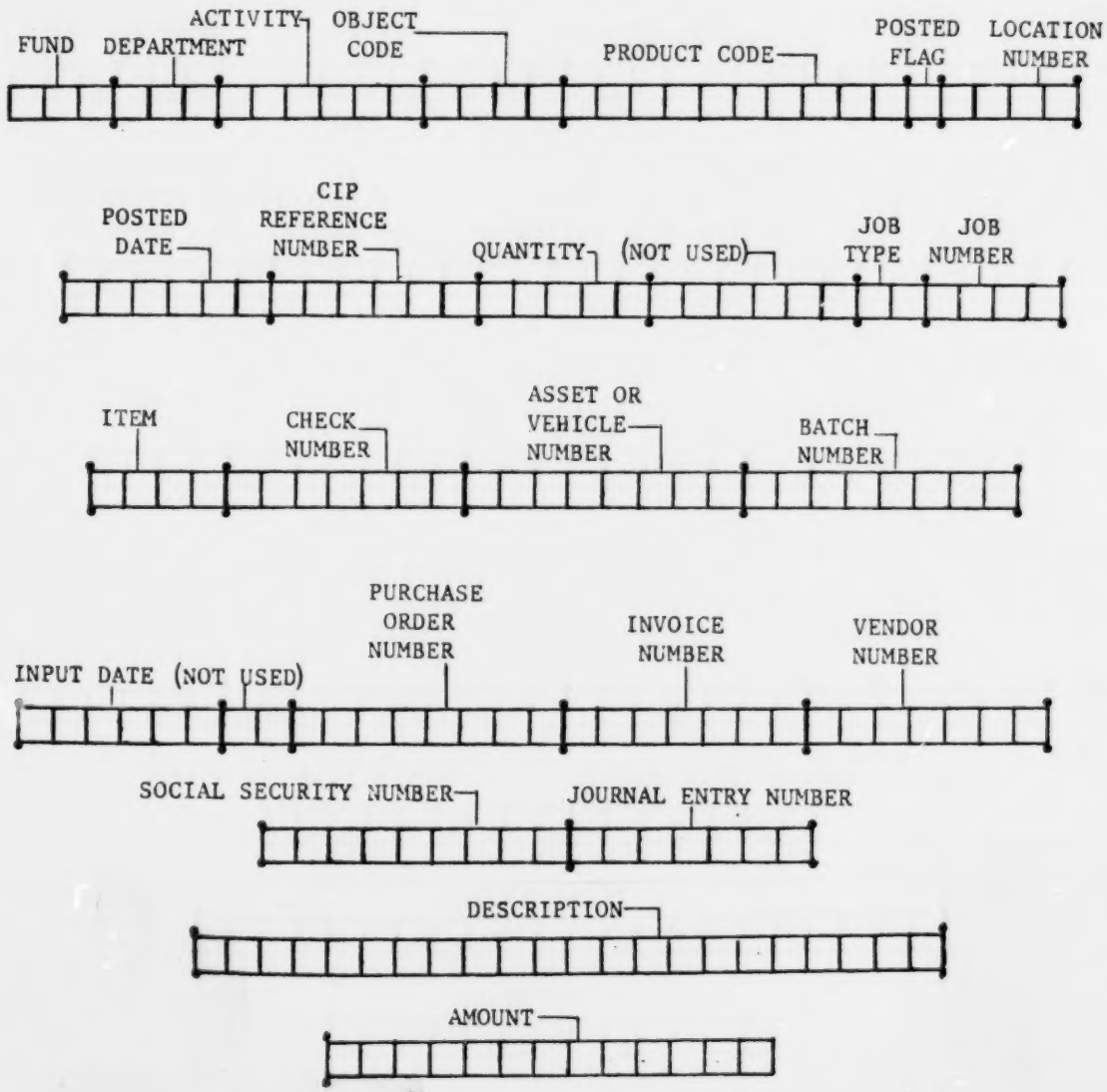


Figure 18.

activity, object code, and product code (if applicable). The other data fields are used when required for other specific applications such as providing for a check number when a check is issued.

A general ledger master file is used on the departmental level as "chart of accounts" since it reflects the complete account number and title, and permits each department to obtain a listing of only that department's authorized account numbers. Chart of accounts is a listing of account segments, arranged systematically.

FIN uses the general ledger as the collection point for all fiscal and statistical information relating to the financial position of the City. All debit and credit transactions (vouchers, invoices, checks, etc.) update the general ledger file, which maintains other fields such as appropriation, encumbrance, expenditure, unencumbered balance, and prior one-and two-year actual expenditure balances. Before FIN will accept any financial transaction, the account must first be established in the general ledger; otherwise, it will be rejected.

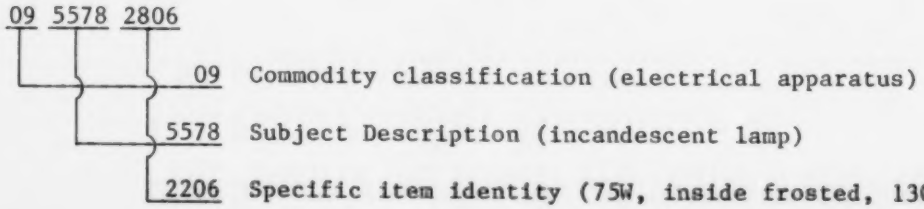
FIN has several subsystems, most of which are described below:

(1) The Revenue and Cash Management system provides a control and reporting mechanism for the handling of all cash, revenues, investment purchase, and maturity transactions.

(2) The Expenditure Management system (Accounts Payable system), in conformance with developmental policy, is based on the overall approach of capturing all data at its lowest generation point. In this case, it is the purchase order that encumbers or obligates the funds, since this function, by law, must occur before actual receipt of the commodity or service. A unique feature of the system is that it allows the City to have only one bank account (except for special funds required by law to be separate). This, in turn, eliminates the need for reconciliation of separate forms, significantly reducing the amount of paper and clerical work necessary to monitor the bank account.

(3) The Purchase and Product Code system provides centralized controls over the purchasing process through automatic issuance of purchase orders. The unique assignment of product codes to every item in the City's budget provides management with a simple method of maintaining controls over all purchases and of inventory. For example:

PRODUCT CODES


09 5578 2806
09 Commodity classification (electrical apparatus)
5578 Subject Description (incandescent lamp)
2206 Specific item identity (75W, inside frosted, 130V)

The system enables management to identify and accumulate quantities of like items from all budgeting elements for the fiscal cycle. Management, in turn, is able to solicit bids valid for specific periods, establish firm prices, and identify individual vendors for various purchases.

(4) The Inventory Management system includes a detailed list of supplies on hand, showing the quantities, description, value, unit of measure, and unit prices, as well as certain historical data concerning bid dates and quantities issued and received. These supplies are used on a recurring basis. Individual inventories are maintained by location, which provides an easy method of identifying supplies. The system provides for automatic maintenance of inventory levels through establishment of predetermined reorder levels, price, and vendor. Purchase orders are automatically issued to purchase items in an effort to reduce errors in ordering and reordering.

(5) The Fixed Assets Management system documents any purchase of a permanent nature that the City does not intend to dispose of or that could not be disposed of without interfering with the operation of the City. These assets usually include land, buildings, equipment, furniture, and fixtures.

COMMENTS

The overall concept of FIN appears to be one of establishing, on a daily basis, a data base with the smallest component required, thereby creating a voluminous and complex system. For example, within FIN, the budget is developed to the lowest level of a product code. The example illustrating the product code shows a 10-digit identity that identifies a 75W, inside frosted, 130V incandescent lamp. If this item is budgeted, but the department should decided later to purchase a clear lamp rather than a frosted one, a budget change would be required. The system may thus foster the requirement for numerous budget changes each month.

A review of the description of FIN reveals that the system was primarily developed from an accounting and fiscal management standpoint rather than from an operational department standpoint. This may be the best overall approach for the City, but a system developed in this manner generally lacks the type of information useful to operational management. For example, the major systems developed for FIN includes Revenue and Cash Management, Expenditure Management (accounts payable), Purchasing, Inventory Management, and Fixed Assets. All of these systems are certainly important to an operational department, but do not include cost-center information for management of a department's operation. An operational manager also needs to know what is happening at the physical points within his organization.

FIN's original development included coding flexibility at department levels using the job/item fields. However, to make proper use of the flexibility, the department needs an in-depth understanding of FIN, as well as an in-depth understanding of the department's operation and the type of management information required for effective management. This requires an effort similar to the activities on this project, including additional programming to obtain the needed outputs.

A study has indicated that it would be difficult, without major modifications, to obtain from FIN, without major modifications, much of the information desired by the Water Department management. Therefore, an alternative of interfacing an existing management information system to FIN was chosen. To accomplish the alternative, the City of Tampa and the EPA developed a CA to provide water and wastewater utility management information using FIN data and MARS programs.

SECTION 4

MARS APPLICATION AT TAMPA

GENERAL

CA No. CR 807440-01 was approved as a research and development project, to be completed over a period of 24 months. The entire project was approved, and the first year was funded. The second year funds were to be requested near the end of the first year activities.

The CA had the following objectives:

1. Evaluate the functioning of the cost accounting portion of MARS (operating at KCWD) at a larger water supply utility.

2. Evaluate the functioning of the cost accounting portion of MARS (operating at KCWD) at a wastewater utility.

3. Evaluate the feasibility of MARS operating on a small computer.

4. Refine and expand MARS to include additional management tools.

5. Improve the transferability of MARS by expanding the total system into a set of computer software and hardware, and continuing the development of features that allow mobility.

6. Provide the Tampa Water and Sanitary Sewer Departments with a management system that will provide timely information for cost.

The project is divided into two phases of 12 months each. Phase I includes the activities accomplished the first 12 months (June 1980 to May 1981) and Phase II includes the activities accomplished during the second 12 months (June 1981 to May 1982).

The Phase I tasks are as follows:

1. Select a small computer.

2. Organize a Review Committee.

3. Develop a plan for installing MARS in Tampa's Water and Sanitary Sewer Departments.

4. Convert the existing MARS computer programs from an IBM 370 environment to a small computer.

5. Produce computerized Tampa MARS reports.

The Phase II tasks were as follows:

1. Modify MARS to the specific requirements of the Tampa Water and Sanitary Sewer Departments

2. Enhance MARS with increased transferability and with new programs.

3. Evaluate the results of the MARS application at Tampa.

This project was considered a research and development project since MARS was to be adapted to a totally different environment. Many of the concerns associated with its adaptation were difficult to predict. For example, the difficulty of using FIN information as source data for MARS was impossible to foresee without in-depth knowledge of FIN and without in-depth knowledge of the management needs of the Tampa departments. The understanding of FIN and how MARS functions with the Tampa departments is a large portion of the activities of the CA. During the Phase I and Phase II activities, many of the unknown conditions surfaced as major problems that caused adjustments or changes to the original plans. The adjustments and changes are discussed in the following portions of this section.

PROJECT ACTIVITIES

Project activities occurred from June 1980 through May 1982 and are covered in this report. These activities were selected for inclusion in this report because they have the best potential of assisting other organizations in avoiding similar problems or to better understand the activities which take place in a major project such as this.

MARS Review Committee

The special clause section of the CA contained a requirement...

AS PART OF THE AGREEMENT, A GROUP OF UP TO FIVE (5) INDIVIDUALS FROM SELECTED WATER AND WASTEWATER UTILITIES (OTHER THAN CITY) WILL BE SELECTED AS A COMMITTEE TO REVIEW AND COMMENT ON THE ACTIVITIES ASSOCIATED WITH THIS EFFORT. THE COMMITTEE WILL BE SELECTED JOINTLY BY CITY, CONSULTANT, AND EPA REPRESENTA- TIVES. THREE (3) MEETINGS WILL OCCUR, WITH ONE BEING CONDUCTED DURING THE FIRST 12 MONTHS. TWO MEETINGS, INCLUDING THE FIRST ONE, WILL BE IN TAMPA: AND ONE MEETING MAY BE AT ANOTHER LOCATION TO BE DETERMINED LATER (USE CINCINNATI, OHIO, FOR PLANNING PURPOSES). THE CONSULTANT WILL CONDUCT THESE MEETINGS, REIMBURSE THE COMMITTEE MEMBERS FOR THEIR TRAVELLING EXPENSES, AND COVER OTHER LIMITED EXPENSES ASSOCIATED WITH THESE ACTIVITIES. . .

In reference to the special requirements of the MARS Review Committee, a meeting was conducted in Tampa attended by Water Department, Sanitary Sewer Department, and Consultant personnel for the purpose of choosing committee members. The following individuals were chosen:

Mr. Thomas E. Stallworth, Jr.
Director, City of Atlanta Water Department

Mr. Victor C. Fender
General Manager, Kenton County Water District No. 1

Mr. Richard L. Straub
Director Public Works, Jefferson Cty, AL

Mr. Garrett Sloan
Director, Miami-Dade Metropolitan Water Authority

Mr. David Kittredge
Assistant Director, Manchester Waterworks, NH

The individual names of the chosen committee members were forwarded to the Project Officer, who granted his approval. When contacted by telephone, each individual accepted the position as a committee member.

Meeting #1

The first meeting was conducted on July 24 and 25, 1980, in Tampa. The meeting consisted of three segments, two on the 24th and one on the 25th of July, as shown in the agenda on Figure 19. The afternoon segment dealt with the background information that led to the development of MARS, and described the MARS concept and its reports and operation. During this segment, MARS was discussed from a user's viewpoint, its application at KCWD, its application to Tampa, the existing Tampa Management Information System (FIN), and how the two systems will interface. Also included in this segment was an overview of the Tampa wastewater system and a tour through the new wastewater treatment facilities. The evening segment consisted primarily of informal discussions about various aspects of MARS and about the utilities of the committee members. During the first part of the morning segment, the committee members asked questions that related to MARS, its application to the Tampa departments, and how it would better interface with other utilities. An overview of the Tampa water system was presented, and a tour was conducted through the two water treatment facilities. After the tour, the committee members met and made specific comments on the MARS project. The two major issues discussed were the conversion of the utility account numbering system to the system developed by NARUC, as outlined in the CA, and how depreciation is viewed by utility management.

ATTACHMENT NO. 1
MINUTES OF THE
EPA/TAMPA REVIEW COMMITTEE

A G E N D A

Thursday - July 24, 1980

1:00 p.m.	Welcome
1:05	Introduction of team
1:10	Purpose and objectives of committee
1:15	Administration
1:20	Data gathering background
1:30	MARS concept Kenton County Water District No. 1 application
1:45	MARS report description
2:15	MARS operation
2:30	MARS from a user's viewpoint
2:45	Break
3:00	MARS application to Tampa
3:15	Tampa's existing system (FIN)
3:30	Tampa's wastewater system
3:45	Tour of wastewater facilities
5:45	Tour completed
7:00	Depart for restaurant for group dinner and discussion
9:00	Return from dinner

Friday - July 25, 1980

8:30 a.m.	Questions from the committee
9:00	Tampa's water supply system
9:15	Tour of water facilities
11:15	Return to meeting facilitiy - coffee
11:30	Each committee member - response and comment (10 minutes each)
12:20 p.m.	Summary
12:30	Committee meeting adjourned

Figure 19

The major points of discussion about the NARUC accounts and about depreciation were as follows:

1. The original concept in producing standardized MARS reports was to use, in addition to the utility's chart of accounts, a chart of accounts developed by NARUC. In opposition to producing a NARUC chart of accounts, Mr. Tippin stated that it was difficult enough to maintain an understanding of one chart of accounts. The introduction of another chart of accounts would increase the difficulty of maintaining an understanding of the system. The result would be confusion, rather than standardization and comparability. Messrs. Fender and Kittredge expressed a similar feeling and added that comparability and standardization were achieved through other features of the system, such as the use of common functions of acquisition, treatment, delivery, and support services, and through the major categories used in the Level III report. The other members of the committee agreed.

2. Depreciation was discussed by the committee several times. The discussion centered around the different types of depreciation; i.e., original cost, present value, replacement value. A suggestion was made that MARS cost centers be totaled before as well as after depreciation.

Near the end of the meeting, each committee member was asked for his comments. The comments are summarized as follows:

a. Mr. Victor C. Fender -

1) MARS has been useful at his utility and he discussed how it had been used in his rate-setting activities with the Kenton Utility Regulatory Commission.

2) Although utilities vary considerably in their operation, the information for effective management of the different utilities does not vary significantly in type, as long as details can be adapted to the utility. Based on his experience, he believes this system does have broad application to other utilities.

3) He supported Mr. Sloan's discussion about the information being useful to agencies that rate bond issues, and believes that the savings that could result in this area alone would be enough to pay for the operation of MARS.

b. Mr. David Kittredge -

1) This review has made him more keenly aware that a small computer used exclusively for utility operations is an essential element in the management of a utility. He felt that the program has application to his utility.

2) He questioned the flexibility of the cost category arrangement within the system, since each utility's interest in analyzing cost differs and each utility has site-specific operating situations. He expressed an interest in seeing the results from Tampa related to this area.

3) A breakout of cost that can be controlled versus cost that cannot be controlled would be helpful at the Manchester Water Works.

c. Mr. Garrett Sloan -

1) A small computer is not in their plans because they have had good results by contracting the computer operations with an outside organization. However, he recognized that MARS would also function in their environment.

2) He thought the concepts are good. He especially liked the levels of report and the way they are structured for different functions within an organization.

3) Borrowing money is a necessity for most utilities. In order to borrow money, a utility must have available timely and accurate financial statements. Financial bonding agencies are interested in how well a utility controls its operating cost. The MARS reports could satisfy the bond rating agency in their analysis of the utility.

4) Cash flow is important to the management of a utility, and cash flow status should periodically be identified in a management information system.

5) Possible improvements are in providing utility management with indicators such as a ratio of the operating cost to the total cost of the utility and values such as water loss.

6) A key need for wastewater utilities is in the area of developing methods of charging customers on a base charge (user charge or customer/overhead charge) and a variable charge (volume or flow charge).

7) He liked the system, but he was surprised that EPA would fund such a program.

d. Mr. Thomas E. Stallworth -

1) MARS is a comprehensive system that has broad application to water and wastewater utilities. The features that provide the broad applications are the techniques used in segregating the reports into different management levels, the fact that MARS covers all costs, and that it will function with any chart of accounts.

2) An attractive feature of the system is that differences between utilities are handled within an interface program rather than changing an organization's operations, thus having minimum disruptive impact on an organization during the implementation.

3) The feature of identifying cost centers in a manner that will allow the actual cost of producing water to be determined as it flows through the system is a valuable management tool. Since the example reflected only Kenton County's operation, he voiced some concern about the system's application for a utility with more than one treatment facility.

4) As a useful manamagement tool, MARS should identify cost to different organizational departments, such as purchasing, engineering, etc.

5) A perpetual inventory system would be a valuable program to include in MARS.

e. Mr. Clyde White (attending for Mr. Richard Straub) -

1) He was impressed with the system and felt that it has an application t their county's utility.

2) He now understood the need for a utility to have a small computer dedicated to a single purpose.

As a result of the MARS Review Committee, the use of NARUC as a chart of account printout was eliminated. The other points made by the committee will be considered as possible enhancements to the computer programs that will be developed during Phase II.

Meeting #2

The second meeting of the MARS Review Committee was held in Tampa, on September 22, 1981, as shown in Figure 19A. The meeting consisted of two segments, one in the morning and one in the afternoon.

During the morning segment each of the committee members discussed any pertinent information about their utility that related to MARS. The followin were discussed:

Mr. Garrett Sloan -

1. The Miami/Dade operation is based on enterprise fund, and it is necessary for Miami to operate very closely to their budget. A difficult problem relating to the budget is that revenues are based on projected water consumption which does not always follow the original projection.

MARS REVIEW COMMITTEE AGENDA

September 22, 1981

9:00 a.m.	•	Welcome & Announcements
9:15	•	MARS Review Committee participation
9:40	•	Overview of Cooperative Agreement
10:05	•	MARS Impact at Tampa
10:20	•	(BREAK)
10:35	•	Implementation of MARS
11:00	•	Tampa MARS Operations
12:00	•	(LUNCH)
2:00 p.m.	•	Computer demonstration
2:30	•	Interim conclusions
2:45	•	(BREAK)
3:00	•	Committee Discussion
4:00	•	Concluding comments
4:30	•	Adjournment

Figure 19A

2. Maintaining close control of the budget necessitates timely revenue and financial records.

3. Even if the utility is financially sound, late financial records leave exposure to criticism.

4. To have timely and accurate records, the organization hired several well qualified certified public accountants.

5. The Miami/Dade data are processed by an outside automatic data processing (ADP) organization using "canned" programs. The ADP service has been satisfactory.

Mr. Dave Kittredge -

1. The City of Manchester, NH, is going to a citywide accounting system, which will affect the utility.

2. There is a concern that this citywide accounting system will not provide the necessary management information needed at the water utility.

3. Their organization is presently becoming a union operation, with some difficulties occurring during the transition.

Mr. Victor Fender -

1. MARS has been an asset to the Kenton County, KY, Water District #1 (KCWD), because it has provided much of the information in making important decisions regarding the utilization of their two treatment facilities.

2. It has helped with the relationship and in establishing rates with the Kentucky Public Service Commission (PSC). MARS reports have been meeting the need for periodic information required by the PSC.

3. The cost figures provided by MARS were utilized in the rate setting process. People reviewing the data, including the Interveners, accepted the MARS data as accurate without question. Therefore, once the accuracy of the data was accepted, the issue became "who pays the cost".

Mr. Tom Stallworth -

1. The Atlanta, GA, water utility is not under a public service commission, but is controlled by the City.

2. They had a rate increase in 1979 and presently need another increase.

3. The new rate increase is needed because of inflation and the new water treatment complex that is presently being added to the system.

Mr. Richard Straub -

1. In the Birmingham, AL area, the city furnishes water and the county provides the sewer service.

2. The city wants to charge higher rates for water outside the city limits.

3. The revenue for the sewer operation is significantly short of that needed to support its total cost.

4. The County, for the first time in 40 years, is laying off personnel.

5. There is a moratorium on prime land, thus restricting development.

Four specific conditions which created problems for MARS were identified and discussed. These conditions are:

1. Matrix size - exceeded computer capacity using the original KCWD matrix.

2. Budget - a new budget is generated monthly in Tampa as opposed to annually in KCWD.

3. Allocation routines - in KCWD data are allocated to a correct cost center based on predetermined information. In Tampa only administrative data are allocated to the cost centers that are supported by the administrative activity.

4. Special edits - in Tampa edits identify improper data received from Tampa existing data files (FIN) while in KCWD the edits are accomplished from source data documentation.

A terminal to the Prime computer was located in the conference room for the purpose of demonstrating the operation of MARS. MARS was described and demonstrated by entering source data from FIN into the programs and receiving special edit reports listing the errors in the data. For demonstration purposes three errors were placed in the data and were correctly detected by the program. Corrections to the errors were entered into the computer system, then the data was rechecked and verified as accurate.

The afternoon segment included a presentation and demonstration of the computer's capabilities. The Prime system was described and demonstrated as to some of its capabilities with respect to multiple uses and graphics. While at the computer, MARS reports Levels I, II, III and a portion of Level IV were printed out.

Each committee member was provided a copy of the computer printout of the four levels of MARS reports. The major discussion centered around the Level IV report. The Level IV in KCWD, which is a large matrix containing the cost centers on one axis and the chart of accounts on another, consists of approximately 20 pages. This same report for the Tampa Water Department consists of over 1,100 pages. The size of this report obviously restricts its use. All people present were in unanimous agreement that some method must be developed which will maintain the matrix system, but eliminate the volume of the report. Several methods for improving usefulness of the report were discussed. These suggestions included exception reports, summary reports, printing information only when cost occurs, having cost centers presented on a CRT, etc.

Near the end of the afternoon segment, three specific questions were addressed by the committee. These questions, along with a summation of the committee's response, are as follows:

1. With respect to management, what do you see as a major challenge in the future?

Committee response - two areas were discussed by the committee, one is selling to the public the cost of future operations; the second is managing time which, in turn, controls cost.

2. Is there a benefit in knowing the total expenses related to a component within a utility system? If "yes" does this cost need to be balanced with the financial system?

Committee response - the consensus of the committee was "yes" to both questions. In the component's case, it is a sound indicator of its performance. In the case of balancing to the financial system, it is the principal method of being sure that all costs are being considered and it provides the confidence that the information is accurate.

3. With respect to cost information, what is the greatest need at your utility?

Committee response - three parameters were identified: special information, timely, and accuracy. Special information is needed, like revenue producing water, so that unit costs can be accumulated as water flows through the system. Timely, so that corrective action can be rapidly taken; and accuracy for assurance that decisions are being made based on correct values.

The meeting was closed after providing each member an opportunity to make summarizing comments. The comments were as follows:

Mr. David Kittredge -
Very much likes the idea of graphic displays for management information.

Mr. Garrett Sloan -
Revenue is the greatest worry of a utility. For MARS to be more effective, a report which identifies revenue and compares it with cost should be included.

Mr. Richard Straub -
The Level I report is excellent. Consideration should be given to exception reporting which will identify critical areas as opposed to providing information on areas functioning normally.

Mr. Victor Fender -
The comments made during the two segments covered all that he wanted to say.

Meeting #3

The third and final meeting of the MARS Review Committee was held in Tampa, on June 22, 1982 and followed an agenda as shown in Figure 19B. The meeting consisted of two segments, one in the morning and one in the afternoon.

During the morning segment, a review of MARS concepts and an overview of the activities that have taken place since the last committee meeting was accomplished. The major difficulty encountered since the last Review Committee meeting dealt with the availability of data in the proper format in the city FIN system. Each of the available FIN files offered some undesirable feature for MARS. The CIP file was finally chosen as the best data location, but the difficulty associated with this file is that data for any month can be added at any time. To overcome this condition, future requests for FIN data will include the time period form which data will be gathered as well as the month desired. These changes were added to the MARS computer programs that create the MARS input data.

This overview was followed by each Review Committee member discussing key issues within their utility, especially relating to MARS. The following areas were discussed:

Mr. Garrett Sloan -

1. The Miami/Dade utility is focusing on examining their total financial picture aimed at refining the operation. Mr. Sloan identified one of their problems being the difficulty of keeping the data current, particularly with payroll, since their payroll presently requires two runs, one for pay purposes and one for data purposes.

2. There is a natural "check and balance" in a utility organization between financial and engineering personnel. One example of this "check and balance" is that the financial people generally desire to hold inventory to a minimum level, thus avoiding capital tie-up in unused hardware. By the same token, engineering desire a high

MARS REVIEW COMMITTEE AGENDA

June 22, 1982

9:00 a.m.	•	Announcements
9:15	•	Key issues at members utilities
9:45	•	Review of MARS concept
10:00	•	Overview since last meeting
10:15	•	(COFFEE BREAK)
10:30	•	Review of output reports
11:00	•	General systems operation
12:00	•	(LUNCH)
1:30 p.m.	•	General systems operation (continued)
2:30	•	Demonstrations of Level VI
2:45	•	(BREAK)
3:05	•	Conclusions of project
3:30	•	Committee comments
4:30	•	Adjournment

Figure 19B

level of inventory which will make available all types of parts needed for rapid repair.

Mr. Dave Kittredge -

1. The Manchester utility continues to have labor difficulties associated with a new labor union which was recently formed at his utility. They are presently working on finalizing the details of the contract.

2. The utility is running into some difficulty in meeting the Public Service Commission (PSC) requirement that all expenses must be "known and measurable." One problem that Manchester has encountered is how to factor future wage increases into their rates.

3. The city has insisted that the water utility use a new computer system purchased by the city. This makes it possible for the city to purchase a larger computer, but may force the water utility into limited computer use and to data format that they may not desire.

4. MARS could do a better job of documentation on their GAC activities than the manual system that they are presently using. A problem with manual systems is that the accuracy tends to decline over time.

Mr. Victor Fender -

1. MARS has been used once for a rate case with the Kentucky PSC. It has worked very well and will be used again in June for a new rate application.

2. Using a manual accounting system, KCWD was able to close its financial records only at year end; thus, they could only submit rate change requests yearly using the latest 12 months of information. With MARS they will close each month; therefore, a rate request change could be submitted at the end of any month.

Mr. Richard Straub -

1. The county is not under the regulation of PSC, but is under three county commissioners who run the sewer system. The area is very conservative. Revenue to offset water and sewer cost is supplemented with ad valorem taxes.

2. Their cost has increased from about 600 to 800 percent in the past eight years. It is hard to get the public to accept that they have been, and are presently, paying only about one third of the sewer cost. It is equally hard to get taxes raised to meet these increases in cost. There has been a six-year moratorium on building.

3. The county has no debt, but there is an exceedingly high deficit in wastewater alone which is going to force the county to do something toward issuing bonds.

4. The county has formed a blue-ribbon committee to investigate the problem and to advise their findings.

The morning session continued with an in-depth review of the Tampa MARS output reports with major emphasis placed on changes from the original format and on additional reports. Two additional reports have been developed. The Level V report for the Sanitary Sewer Department provides a summarized report by cost centers for each cost category. Level VI, developed for both the Water Department and Sanitary Sewer Department, allows an individual cost center to be displayed on a CRT for rapid review and analysis. The program then shifted to a review of the general operation of MARS. This started with a detailed review of the flow diagram of the computer programs that comprised Tampa MARS. The Water and Sanitary Sewer Departments's flow diagrams were related to the physical computer operations and commands that are necessary to execute the processing.

The afternoon segment continued the presentation of the MARS system's operation. This segment also covered the personnel required for the operation and the forms that have been developed to help control the operation and to produce a smooth flow of data. Sample printouts of all the MARS results were included in the handouts to the committee members. Afterwards, MARS operations were demonstrated on the Prime computer which printed a limited number of reports.

The conclusions reached for the Tampa MARS project were reviewed. They are as follows:

1. MARS was less adaptable to the Tampa utilities than anticipated.

2. MARS concepts are transferable.

3. Adaptation to wastewater is no more difficult than to water.

4. Use of small computer (PRIME 250) is feasible.

5. Ease or difficulty of future applications is dependent upon financial operations at the host.

6. MARS assisted in detecting FIN errors.

7. Value of MARS not yet determined in Tampa.

The final portion of the meeting was to provide time for each Review Committee member to provide their final comments. Two members submitted written statements which are as follows:

Mr. Garret Sloan -

> Financial reporting by publicly-owned water and sewer utilities has only recently been the subject of investigation and analysis on a nationwide basis. The methods vary widely among communities, based on the municipal or county finance officer's ideas. The group with the most uniform reports is probably those who operate as the enterprise funds, because of more uniform objectives and the need for financial reporting as a means of exercising management obligations. With this background, the undertaking of the MARS project was an act of courage because its chances of early implementation on a nationwide basis are obviously remote. It should be viewed as a pioneering effort, many years ahead of its time. The problems encountered in implementation will be of extreme value to others who will eventually seek to achieve similar objectives.
>
> The actual work product is most satisfactory and provides the information required for the management of a well run publicly-owned water and sewer utility. The problems described during the Review Committee meeting on June 22, 1982, relating to keeping current with the continuous flow of information into the data processing system, are typical of all computerized accounting systems. The various difficulties related by the Tampa water and sewer employees are similar to those which I have personally experienced on a day-to-day basis in the operation of the Authority's data processing accounting systems. In other words, the endless task of cleaning up data entry should not be viewed as anything unusual or difficult.
>
> In analyzing the work product of the MARS project, many of the cost items are merely routine personnel charges and other expenditures which arouse very little interest upon review, because they were anticipated and budgeted. It is the unusual cost, which had not been anticipated, that creates problems for management in staying within its annual budget limitations. These unusual costs are always the subject of separate investigations and studies within an organization. The MARS system certainly facilitates such analyses.
>
> I personally stressed the importance of revenue information which has been included in the MARS system. Often there is a revenue cost relationship due to seasonal weather conditions which are of concern to management. For example, extraordinary electric power costs for water pumping can be entirely justified by the additional revenue received during an extended period of dry weather, so that management should not be attempting to curtail such expenditures in excess of budget because they are balanced by aditional revenues.

Mr. Victor Fender -

The MARS system was established as a valuable management tool for water utilities at Kenton County, Kentucky, Water District. I feel that the Tampa project has demonstrated that the MARS system concept is adaptable not only to other water utilities of various sizes, but also to wastewater utilities.

It appears that a utility using the NARUC chart of accounts could convert to the MARS system with minimum difficulty. Individual system differences can in many cases, be accommodated by minor program changes.

As the cost of utilities continues to increase, management tends to be held more and more accountable, both to the regulatory agencies and the public. The MARS system provides accurate and useful information to control costs as well as to provide answers to the concerns of those effected.

I think each utility would do well to examine this system in light of their individual requirements.

Mr. David Kittredge and Mr. Richard Straub felt that MARS had good possibilities for their utilities, that it does have a universal application, and they agreed in principal with what had been discussed earlier.

Computer Selection

After negotiations between Tampa and EPA concerning the CA were under way, the City foresaw a potential problem in the purchase of hardware for the small computer. It was anticipated that the process of choosing the best hardware might take three months, and the delivery and installation might take another six months or more. If this process were not to start until after the CA was finalized, much or maybe all of the first phase of the CA could pass before hardware was available. The City therefore decided to start the computer selection process before obtaining approval of the CA. Thus, in March 1980, the City appointed a computer selection committee consisting of a representative from each of the following organizations:

1. Sanitary Sewer Department
2. Water Department
3. Management and Information System Department (City computer)
4. Consultant

Both the Water Department and the Sanitary Sewer Department had existing specialized computer programs that were operated by their personnel. If a computer was to be obtained for the use of these departments, it would need the capability of supporting the existing programs. Therefore, the selection of computer hardware could not be based purely on MARS requirements, but would have to go beyond those of MARS.

The objective of the committee was to identify for Tampa's Water and Sanitary Sewer Departments the best computer hardware and operational software to support the MARS project, with considerations being given to future application within these Departments. The following procedures were followed by the Computer Selection Committee in accomplishing their objective:

(1) Delegation of Committee Responsibility. The committee elected the Water Department representative to act as chairman and coordinator. The Consultant was given the responsibility of establishing contact with the computer vendors to obtain product information and to coordinate the request for proposal (RFP).

(2) Determination of Computer System Requirements. Each member of the committee provided computer criteria in determining the basic minimum requirements of the computer hardware. The consultant focused on MARS requirements while the others focused on their own department needs. Figure 20 is a summation of these requirements.

(3) Determination of the Computer Vendors That Provide Hardware That Meet the Basic Requirements. The requirements having been defined, a data processing buyer's guide provided the names of several manufacturers of computer systems that would meet the requirements.

(4) Request for Proposal Procedures. Based on the summation of requirements, the Consultant prepared an RFP and mailed copies to those computer vendors who were identified as having equipment that met the minimum requirements. Figure 21 is a copy of the RFP.

(5) Development of Recommendations. The Consultant, in an effort to provide some type of comparison of the responses received in response to the RFP, developed a comparative worksheet that described each response to the RFP, including equipment and cost. The worksheet, plus the detailed documentation provided by the vendors, was reviewed by each member of the committee. In early June, the committee met to discuss the details of each proposed hardware system. During the discussion, each member agreed to contact a user of each proposed hardware system in order to discuss and if possible observe the operation of the equipment. In late June 1980, the committee conducted their final meeting, at which time they selected the Prime computer and drafted their recommendation for the acquisition of computer hardware. Figure 22 is a copy of the letter of recommendation.

One of the minimum requirements stipulated by the Computer Selection Committee (see sheet 2 of Figure 21, para A) states: "The system software must have been in use at least two years with the proposed hardware." This requirement was included because Tampa's emphasis was on obtaining reliable performance in a computer system, and not necessarily the latest state-ofthe-art system. It was felt that the latest system could have problems in the hardware and/or operating software that might not yet have been resolved or maybe not yet even identified. Reliable and proven operating software is especially important in the development of new programs such as MARS. If the operating software is reliable, the resolution of

TAMPA COMPUTER HARDWARE

MINIMUM REQUIREMENTS - BASIC SYSTEM

Listed are the basic minimum requirements for the computer system. Also indicated are additional desirable features that should be available through expansion of the basic system or through separate purchase of a peripheral device.

A. Hardware

1. CPU - 128K bytes main storage memory
2. Disc - 1 unit, disc pack/cartridge drive (20M bytes min.)
3. Printer - 1 unit, low speed (120-300 LPM)
4. CRT - 2 units, upper and lower case character sets (80 characters X 20 lines)

B. Software

1. Assembler
2. Compilers
   a. Fortran
   b. Cobol
   c. Basic
3. Operating Systems
   a. Batch, real time, and time sharing supported operating system (multi-tasking/multi-programming)
   b. Virtual memory
   c. Data base management system
   d. Sequential, random file access

C. Communications

1. Must support a minimum of 8 lines
2. Synchronous/asynchronous lines available
3. Protocols supported - IBM, DEC

D. Other key requirements

1. Local Tampa-supported manufacturer's maintenance service
2. Established software packages in use for a minimum of 2 years
3. Expandable system
4. Designed to operate in office environment

Desirable Features (Not Required)

(Information to be furnished by vendor for further evaluation)

A. Hardware - Availability/cost

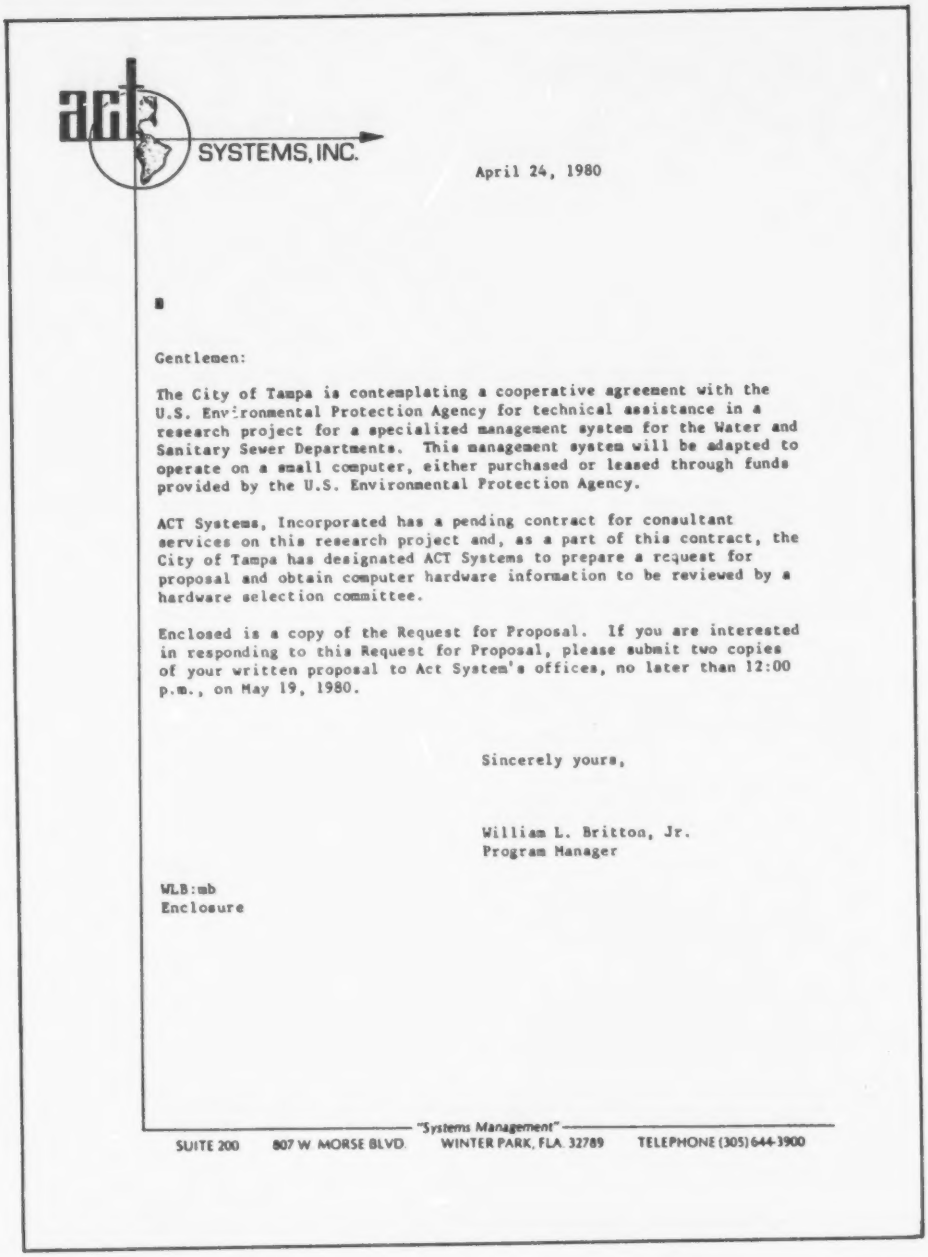
1. Tape drive (reel to reel)
2. Plotters
3. Graphics terminals

B. Software

1. Word processor
2. Compilers
   a. PASCAL
   b. RPG
3. Application packages and availability
   a. Business
   b. Civil Engineering
4. Graphics system

The EDP buyer's guide information that we have reviewed indicates systems supplied by DEC, Hewlett Packard, Data General, Prime, and Texas Instruments generally meet the above outlined requirements. There are possibly other systems that should be reviewed also.

Figure 20.



ACT SYSTEMS, INC.

April 24, 1980

Gentlemen:

The City of Tampa is contemplating a cooperative agreement with the U.S. Environmental Protection Agency for technical assistance in a research project for a specialized management system for the Water and Sanitary Sewer Departments. This management system will be adapted to operate on a small computer, either purchased or leased through funds provided by the U.S. Environmental Protection Agency.

ACT Systems, Incorporated has a pending contract for consultant services on this research project and, as a part of this contract, the City of Tampa has designated ACT Systems to prepare a request for proposal and obtain computer hardware information to be reviewed by a hardware selection committee.

Enclosed is a copy of the Request for Proposal. If you are interested in responding to this Request for Proposal, please submit two copies of your written proposal to Act System's offices, no later than 12:00 p.m., on May 19, 1980.

Sincerely yours,

William L. Britton, Jr.
Program Manager

WLB:mb
Enclosure

"Systems Management"

SUITE 200 807 W. MORSE BLVD. WINTER PARK, FLA. 32789 TELEPHONE (305) 644-3900

Figure 21

REQUEST FOR PROPOSAL

The City of Tampa, in conjunction with the U.S. Environmental Protection Agency, invites your response to the requirements for the following computer hardware:

A. GENERAL

The proposed hardware should be considered both as a stand-alone system and as a distributive processing unit. The system must be designed to meet minimum configuration initially, but be expandable to provide for a larger system. It should operate in a normal office environment. The system must have manufacturer's maintenance available, within the Tampa area, for both the hardware and systems software, and provide for technical support, including training. The system software must have been in use at least two years with the proposed hardware.

The selection committee reserves the right to decline any and all responses. The decision to purchase/lease the hardware may not be made on price basis alone, but may include maintenance, support, etc. The hardware system must be available for delivery within 30 (thirty) days after selection.

All responses must be delivered to Mr. William L. Britton, Jr., Program Manager, ACT Systems, Inc., 807 West Morse Blvd, Winter Park, FL 32789, (305-644-3900) no later than 12:00 p.m., May 19, 1980.

B. HARDWARE

1. One complete computer system with 128K bytes main memory, with expandable memory features.
2. The system should include a single, 20M bytes minimum, disc pack/cartridge drive and must be designed to provide for expansion of additional data storage.

Figure 21 (cont'd)

3. A standard 180-character per second, 132-column, 6 or 8 line/inch print printer.

4. Two standards CRTs, complete with upper and lower case character sets, function keys, and numeric keypad.

C. SOFTWARE

1. Assembler

2. Compilers

   a. FORTRAN

   b. COBOL

   c. BASIC

3. The operating system software should be batch, real-time, and time-sharing supported (multi-tasking/multi-programming); have virtual memory, sequential and random file access; and provide for a data base management system.

D. COMMUNICATIONS

1. The System must have support of at least 8 communication ports; have capability of providing remote job entry; synchronous/asynchronous communication with other systems such as IBM and DEC.

E. ADDITIONAL AVAILABLE FEATURES

Provide the availability and pricing of the following features: (NOTE - these features are not to be part of the proposed hardware, however their availability and cost will be considered in the overall evaluation.)

1. Hardware

   a. Tape drive (reel to reel)

   b. Plotters or plotter adapter

   c. Graphic terminals

2. Software

   a. Word processor

   b. Compilers - PASCAL and RPG

   c. Business, engineering, and graphics application packages

Figure 21 (cont'd)

CITY OF TAMPA, FLORIDA

To: Directors, Tampa Water/Sanitary Sewer Departments MARS Computer Selection Project

From: MARS Computer Selection Committee

Subject: MARS Computer Selection Report Date: June 26, 1980

Based on our three-month evaluation period, the Committee has reached a final decision regarding acquisition of a small computer system for the project. Our recommendations to the Directors of the project are as follows:

1. That the Directors pursue acquisition of a computer system via a lease-purchase agreement with the City retaining final purchase options.

2. That support be provided by the City's Management & Information Systems (MIS) Department as agreed to by John McGrath, Director of the MIS Department. In addition, the MIS Department has agreed to provide a full-time, senior-level Systems Analyst to support the operations of the project computer program effort, including interfacing with the City's existing FIN computer software.

3. The computer system should be physically located within the Water or Sanitary Sewer Department's area of the Tampa Municipal Office Building. We believe that this is necessary for effective control, operation, and utilization of the computer system by project personnel and other users.

4. Based on thorough evaluation of all proposals provided, PRIME Computer, Inc. has offered what we believe to be the most cost effective and reliable system within the criteria and specifications established by the Committee for the project. Therefore, we recommend that the project directors authorize the project contractor to begin project negotiations with PRIME Computer, Inc. This recommendation is subject to having the vendor execute successfully a test of the MARS software and other Water/Sewer programs.

Bruce E. Kennedy, P.E.
Committee Chairman

BEK/jah

cc: Mike Ayers
Bill Britton
John McGrath

Figure 22

problems can focus on the program being developed. If, however, the operating software is unreliable, there is a question as to the location of the problem.

The Prime computer was selected based on meeting all of the hardware and operating system requirements as well as having additional attractive features for Tampa. The processor and software had a proven record of over two years of reliable performance. The University of South Florida, a nearby institution, conducted an investigation of computer hardware/software and purchased a Prime computer system. Prime uses a 32-bit processor compared to a 16-bit processor provided by all but one other computer system. The exception was a new system, relatively new on the market. Also, the Prime hardware could be installed and operating in a reasonable time period. Probably the most attractive feature of the Prime system is that it can be expanded into a larger computer and the original programs will function on the expanded system without major reprogramming. According to the Selection Committee's evaluation, the Prime computer although not the system lowest in the cost that could process MARS, it was the best value for the City's requirements.

Based on the Computer Selection Committee's recommendations, the City (with EPA's approval) accepted recommendation 1 (lease of computer by City), 3 (physical location of the computer in the Water or Sanitary Sewer Department's area), and 4 (purchase of the Prime computer) (see Figure 22). The management of the computer (recommendation 2) was initially to be shared between the Water Department and the Sanitary Sewer Department, with the final management structure to be determined at a later date.

On September 22, 1980, the Prime computer hardware was delivered to Tampa. It was physically installed in the Sanitary Sewer Department office area. The operating software was installed on the hardware, and the computer system was operational and in use within a week.

Throughout the first year, the Prime computer and its operational software functioned as anticipated. By the end of Phase I, special applications by the Sanitary Sewer and Water Departments, along with MARS development, were reaching the capacity of the computer usage for an 8-hour day.

MARS Application to Wastewater

Conceptually, the adaptation of MARS to a wastewater operation proved no more difficult than its application to a water utility, except for the initial conversion of terms. For example, MARS is designed to sum detail cost into four major functions of acquisition, treatment, delivery, and support services. To stay within the MARS concept, this structure of four major functions must be maintained. For wastewater application, these terms are not appropriate. Furthermore, in water operations, the base for productivity (the value that identifies unit cost of $/MG) is RPW (revenue-producing water); in wastewater, there is no equivalent value. In

developing the terms for wastewater utility functions, the following two groups were selected:

1. Collection - All costs associated with moving wastewater to the treatment facility.
   Treatment - All costs associated with removing the impurities from the wastewater and with preparing the impurities for disposal.
   Disposal - All costs associated with disposing of the liquids and solids after the tretment activities.
   Support Services - All costs associated with support activities related to the utility and not a part of the above three areas.

2. Collection - All costs associated with moving wastewater to the treatment facility.
   Treatment
   Liquid - All costs associated with the liquid portion of the treatment process where impurities are being removed.
   Solid - All costs associated with the solids portion of the treatment process where the impurities are being conditioned.
   Support Services - All costs associated with support activities related to the utility and not a part of the above two areas.

The difference in the liquid and solid treatment (approach 2 above) can be seen in Figure 12. The processes on the vertical line on the left side of Figure 12 describe the liquids treatment since they all relate to activities associated with removing impurities from and handling of liquids. The horizontal functions, which move out from the vertical flow, such as sludge thickening and drying beds, relate to activities associated with solids that have been removed from the liquid wastewater. By using this method, definitive costs can be obtained for the different treatment processes, and can be identified on all levels of reports as liquid and solids. The problems associated with using this approach are the requirement for coding detailed source data. Coding may become difficult because two processes sometimes occur at the same physical location.

The first approach has the advantage that the treatment process can be identified to any detail desired (including separation of the liquids and solids) in Level IV of the MARS report. The only disadvantage is that it does not identify the liquids and solids cost to the higher level reports but sums them into a total treatment cost. The Sanitary Sewer Department personnel preferred the first approach because they felt that it provided them with more flexibility in identifying the treatment cost to the process configurations most meaninful to them.

Another difference in the two approaches is that the first allows the disposal cost to be identified as a separate function. In the second approach, the liquids disposal cost must be added to the liquids treatment cost and likewise the solids disposal cost to the solids treatment cost. Tampa incurs no disposal cost because the treated effluent flows by gravity into Tampa Bay. In addition, dried sludge (the solids portion of the waste stream) is purchased after it is removed from drying beds.

From an overall MARS standpoint, the Tampa operation is not typical of disposal activities. Other utilities are landspreading their final liquids and/or landfilling their solids, thereby incurring a disposal cost. Thus, it was considered desirable to include the major function of disposal. Although no disposal cost is incurred at Tampa, the Sanitary Sewer Department still preferred the first approach, and this configuration was therefore used for the wastewater application. With minor program adjustments, both approaches can be available to MARS.

The wastewater productivity (unit value) is limited to two possibilities: raw wastewater and treated wastewater. Raw wastewater is the quantity that is available to be treated, while treated wastewater is the quantity that is actually treated. Treated wastewater was selected as the expression for productivity (unit value) to be used in MARS since it represents the actual flow through the treatment facility.

All other problems associated with MARS application to wastewater are similar to those that may be expected in application of MARS to any utility. For example, the structure of some of the output reports was different for the Sanitary Sewer Department than for the Water Department. The differences were primarily in individual management philosophies rather than differences between water and wastewater operation.

Tampa MARS System Development

There are two major tasks - system development and computer program development (to be discussed later) - associated with accomplishing Phase I of the CA. The first task is system development, which establishes the foundation for the computer programming, and includes the following:

1. Understanding FIN (the City's financial reporting system), which is to provide most of the source information.

2. Understanding the operational layout and the management structure and needs of both departments.

3. Determining how MARS obtains source data from FIN, describing the cost of each department's operation, and the format of reports to meet each department's management needs.

4. Documenting desired MARS outputs for both departments.

5. Documenting the changes needed in FIN and other additional source data necessary for desired MARS outputs.

6. Coordinating the decisions with key individuals.

MARS system development started in June 1980 with the planning for the start-up briefing. On June 19, 1980, the start-up briefing was presented in Tampa and was attended by representatives of the Water, Sanitary Sewer, and Management and Information Systems Departments. The purpose of the briefing was to review the plan of action for accomplishing the project, and if any area was not acceptable, to adjust the plan accordingly. The meeting consisted primarily of a review of the activities and schedule shown in Figure 1a - 1c. The plan as presented was approved and activities to accomplish the plan were started.

An understanding of the City's FIN and of the operation and management of the Water Department and the Sanitary Sewer Department is the first step of the plan. FIN and the Departments are described in Section 2 of this report.

Interface with FIN--

In developing an understanding of FIN, it was immediately apparent that FIN was considerably different from the KCWD financial system. For example, KCWD uses the NARUC chart of accounts, which is designed specifically for water utilities. Using NARUC chart of accounts, the individual accounts are very descriptive of an expense item. In FIN, the actual expense item (account number) is difficult to define since it is described in several groups of fields of numbers. The closest single field that best describes an expense item is the object code. The object numbers are the same for all city users, from the Purchasing Department to the Water Department. Thus, the majority of the object numbers are general to water operations; i.e., in FIN all labor is identified by one object code number, while in the NARUC chart of accounts labor is divided into several different numbers that identify labor as supervision, operations, maintenance, etc.

Another major difference is that KCWD has direct control of all source data that is entered into their financial reporting system. In contrast, the Tampa Water Department does not control all of their source data. For example, the Purchasing Department performs much of the purchasing for the Departments and accomplishes the FIN data entry for that function. Therefore, even changes to FIN coding and the correction of data problems involves more than the Departments using MARS.

A third major difference in the financial system relates to MARS source data. In Tampa, the source data elements for MARS are to be retrieved at a a point in data processing where the MARS data is included with all other data for the city. Thus, many thousand data elements must be reviewed in order to select the appropriate data elements for the Water and Sanitary Sewer Departments. The loss of a single data element could prevent MARS from balancing with FIN. In KCWD all MARS data are for the utility, and thus specific data does not have to be separated.

A fourth major difference, which was not understood during the planning portion of the program, is that FIN is a dynamic system that has a continually changing data base, allowing expense entries at any time for any period. For example, an expense for October may be held for one or more months, for various reasons, and then entered into the FIN system. This did not appear to be a major problem until it was recognized that payroll fell into this category. At times, several months passed before proper data was attached to payroll for FIN, thus a major portion of one month's cost would appear as another month's expense. A specific example of this is that the October water utility payroll information was not entered into FIN with the charge identifier until January; thus a printout run made earlier would not produce a MARS report with all of the October data. In KCWD all data needed for MARS was entered into the Financial Reporting System on a timely basis.

Since MARS is to use FIN data, the MARS data must come from the FIN data file (see Figure 18). FIN data does not provide all of the information needed by MARS. Basically, the problem centers around a MARS requirement for data that identifies the cost center where the expenditure occurred. Cost centers are not available in the existing FIN data. For example, MARS identifies an expense item such as electrical power to a cost center such as Hillsborough High Lift Pumps. FIN does not identify the cost center, and a method must therefore be found to include the cost center identifier. The problem in using FIN data is also amplified by the general description of the chart of accounts. As discussed earlier, in FIN, labor is one expense item; in MARS, the type of labor (i.e., operation, maintenance, supervision, etc.) is important. As a result, the cost center identifier must also include a method by which the expense item can be more defined.

In examining the data elements in the FIN data file layout (Figure 18), data groups of activity, object, job, and item, as shown below, were chosen to provide MARS information.

ACTIVITY	OBJECT	JOB	ITEM
XXXXXX	XXXX	XXXX	XXXX

(FIN coding used by MARS)

ACTIVITY - minor organizational/project identifier (budget classification)
OBJECT - expenditure classification (account number)
JOB - project/work order identifier (cost center)
ITEM - job modifier (expense type - for Water Department additional digit for cost center - for Sanitary Sewers Department)

The activity codes are for budget classification and will be used primarily in that area. The object codes become the MARS account numbers. The job and item codes are the two areas chosen as the location for the MARS cost centers.

The Water and Sanitary Sewer Departments have been using the job and item codes for several years to provide special work order, capital, and other types of information. Since they did not wish to discontinue that practice, limits were placed on the use of these two data fields. Unfortunately, the way in which the two departments had chosen to use the codes was different, which forced MARS to use the fields differently.

The four digits of the job field and the first digit of the item field were selected to be coded with the necessary MARS information. In using these fields, the Water Department limited the use of the job field to numbers below 5000, because the higher numbers were designated for capital expenditures. Another requirement of the Water Department was that the first two digits of the job field must match the last two digits of the activity code, which was their method of allowing flexibility in changing expenses to various cost centers and having these expenses applied to the proper budget items. This actually decreased the usable field for MARS to a total of three digits. The Water Department wanted MARS to identify types of cost, such as operation, maintenance, etc., which are not identified in FIN. The last digit in the item field was chosen for this purpose, leaving only two digits for cost center identification. An examination of the physical water system revealed that there were less then 99 (maximum number of cost centers that could be identified with two digits) cost centers. The two digits would be adequate, if successive numbers could be used. However, the two digits make cost center identification completely different from the method at KCWD. There, four digits were used, the first indicating the function (acquisition, treatment, etc.) and the remaining digits subfunction (see Figure 8). Therefore, a different approach was developed to handle the cost center. Figure 23 is a conceptual layout of the Water Department cost center arrangement. As shown in Figure 23, the first two digits tie in with the activity (budget) code, the next two digits are sequential numbers that identify cost centers, and the last digit identifies the type of expense.

The Sanitary Sewer Department had made a different application of the job and item fields, and thus required a different approach in establishing cost center numbers. Besides the different usage, their number of cost centers significantly exceeds that which can be described by two digits, requiring the number of digits that identify cost centers to be increased to three digits (last two digits of the job field and first digit of the item field).

The Sanitary Sewer Department uses a different method than the Water Department to relate to the budget, so it is not necessary for the first two numbers of the job field to match the last two numbers of the activity field. At this point, the only similarity between the Water Department and the Sanitary Sewer Department cost center numbers is that they both use the same spaces in the FIN data field. Figure 24 is a layout of the Sanitary Sewer cost center arrangement.

TAMPA WATER DEPARTMENT

JOB NUMBERS BY FUNCTION
****

ACQUISITION

(LAST TWO DIGITS OF ACTIVITY CODES 533001, 02, 03, 04, 05, 06, 07, 10, 11, 12, 13, 14, 15, 20, 21, 25, and 26)

XX01X	SULPHUR SPRINGS INTAKE & PUMPING
02	SULPHUR SPRINGS TRANSMISSION
03	HILLSBOROUGH RIVER DAM
04	HILLSBOROUGH RIVER DAM GROUNDS & BLDG
05	HILLSBOROUGH RIVER DAM HOUSE
06	HILLSBOROUGH RIVER INTAKE
07	HILLSBOROUGH RIVER LOW LIFT PUMPING
08	HILLSBOROUGH RIVER TRANSMISSION
09	SATELLITE WELLS
10	SATELLITE WELLS PUMPING
11	MORRIS BRIDGE WELLS
12	MORRIS BRIDGE GROUNDS & BLDGS
13	MORRIS BRIDGE LOW LIFT PUMPING
14	MORRIS BRIDGE TRANSMISSION

TYPE OF EXPENSE:	1 OPERATING SUPERVISION
	2 OPERATING ENGINEERING
	3 OPERATING GENERAL
	4
	5 MAINTENANCE SUPERVISION
	6 MAINTENANCE ENGINEERING
	7 MAINTENANCE GENERAL
	8
	9

Figure 23

TAMPA SANITARY SEWER COST CENTERS

The Sanitary Sewer cost center numbering scheme consist of combinations of five (5) digits. The first three digits of the cost center number will represent the actual cost center within the Tampa utility system. The following are the (3-digit) cost centers that have been assigned by the Sanitary Sewer Department:

Support Services cost center numbers: 800-899

Collection cost center numbers: 100-300

Treatment cost center numbers: 000-099

Disposal cost center numbers: (no numbers assigned to disposal)

(EXAMPLE: 323-- = 19th St Trunk
24th St Trunk)

The next digit (4th digit) has reference to types of work performed at collection, treatment, and disposal cost centers (not support services). The following represents the identification given to the 4th digit of the cost center numbering scheme:

0 = Operating - Plant
1 = Operating - Pump Station
2 = Electrical
3 = Mechanical
4 = Bldgs/Grds
5 = Instrumentation
6 = Maintenance - Lines
7 = Preventive Maint. - Lines

(EXAMPLE: 3236- = 19th St Trunk
24th St Trunk
Maintenance - Lines)

The next digit (5th digit) has to do with the 300 - 399 cost center numbers of the collection system only. This digit describes the type of lines/pipe in the collection system as follows:

1 = House connections
2 = Trunks
3 = Interceptors
4 = Force Mains
5 = Laterals

(EXAMPLE: 32362 = 19th St Trunk
24th St Trunk
Maintenance - Lines
Trunk)

Figure 24

As shown in the Figure 24, the first three digits identify cost centers with specific cost center range of numbers relating to functions such as collection. Numbers within the range are sequential and relate to specific cost centers such as the Krause Street pump station. The fourth digit is used with all cost centers, except support services cost centers identifying the type of expense. The fifth digit is used only with collection cost centers to identify a specific type of work.

Operational Configuration--

After the method for identifying the cost centers was developed, the next step was making application of cost center numbers to the specific entities of the department. This entails following the flow of liquids from the point where they enter the system until they are dispersed at their final destination, and identifying each element of the physical system that may incur cost. Within the MARS concept, it is important that the cost centers represent the entire physical system. For example, in a water utility with a ground source of water, the well may be one cost center, the pump that lifts the water another, and the pipe that transmits the water to a treatment facility, another. This type of identification of cost centers will continue for the entire utility. These numbers will be coded into the normal FIN source documentation by the normal procedure and later will be retrieved for MARS.

Figure 25 is a Water Department schematic with the cost centers identified. The figure shows that the Sulphur Springs intake and pumping is cost center 01. If the expense is for general maintenance, the digit 6 would be added to create the code xx016 (see Figure 23 for the code structure). The first two digits would become the same as the last two digits of the activity code.

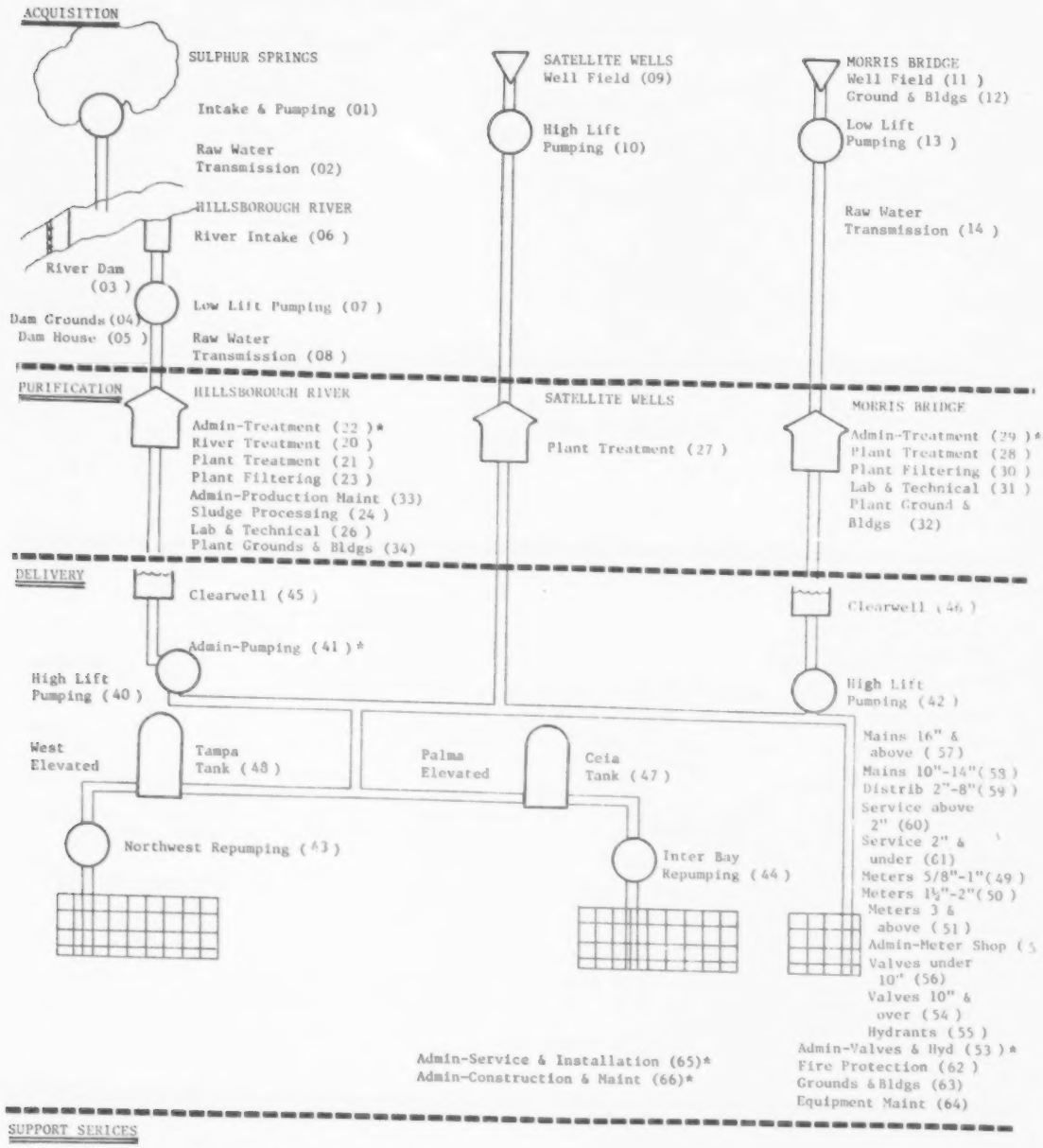
Figure 26 is the schematic for the Sanitary Sewer Department, and shows the specific Sanitary Sewer cost centers. For example, the Sanitary Sewer collection section shows cost centers assigned to specific zones; i.e., a zone 1 pump station is cost center 211XX. If the expense was for maintenance, the cost center would become 2113X (see Figure 24 for the code structure). Since the cost center does not fall between 300 and 399, the fifth digit will not be used.

Report Format--

Another important task of the development activities was the layout of the MARS output reports for both departments. These layouts were actually developed prior to final documentation of the cost centers discussed above, since their purpose is to show concepts rather than details.

Each of the levels of planned reports follows the original MARS concept and can be compared to the KCWD output reports shown in Figures 4

CITY of TAMPA WATER DEPARTMENT
SYSTEM SCHEMATIC



* Admin Cost Centers are allocated to other cost centers based upon direct charges made to other cost centers.

Figure 25.

CITY OF TAMPA
SANITARY SEWER DEPARTMENT
SYSTEM SCHEMATIC

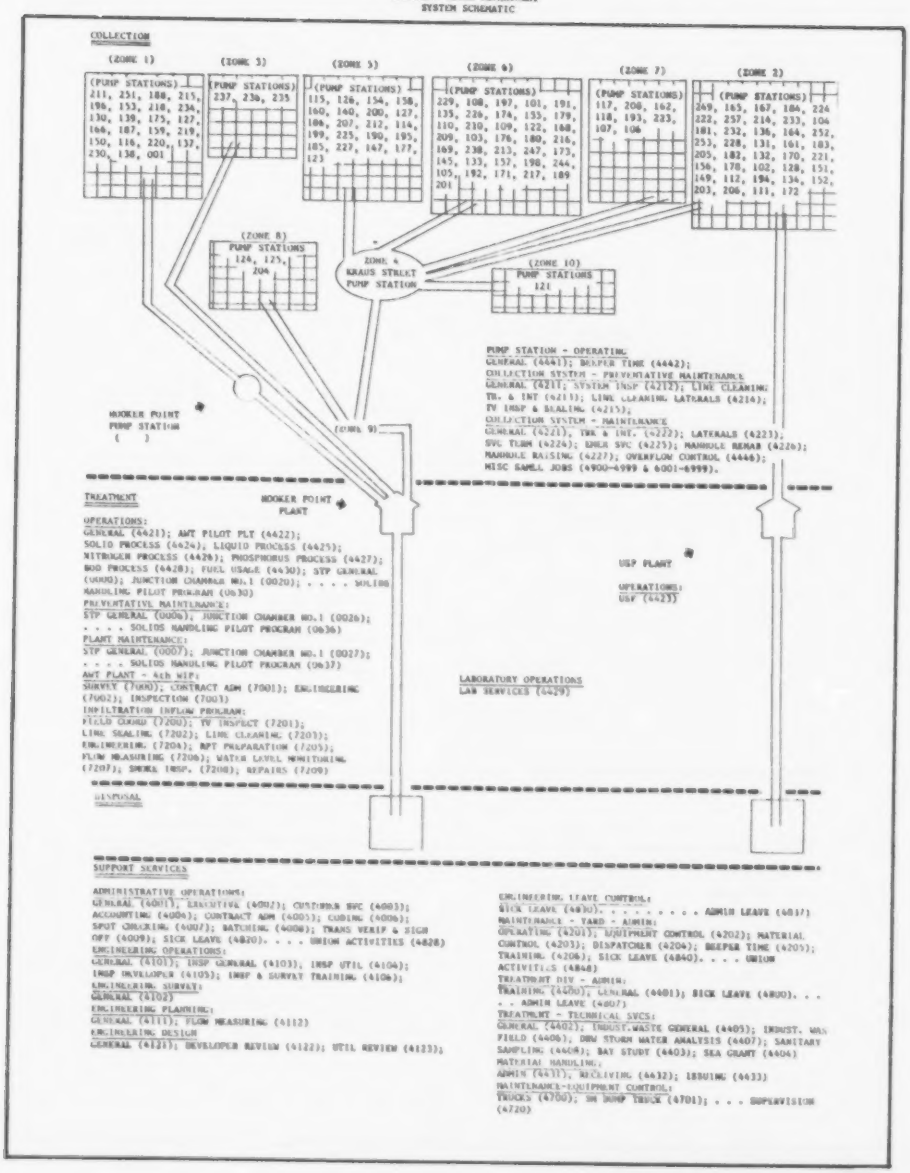

COLLECTION
(ZONE 1)
(PUMP STATIONS)
211, 251, 188, 215,
196, 153, 218, 234,
130, 139, 175, 127,
164, 187, 159, 219,
150, 116, 220, 137,
230, 138, 001
(ZONE 3)
(PUMP STATIONS)
237, 230, 235
(ZONE 5)
(PUMP STATIONS)
115, 126, 154, 150,
160, 140, 200, 127,
106, 207, 212, 114,
199, 225, 190, 195,
185, 227, 147, 177,
123
(ZONE 6)
(PUMP STATIONS)
229, 108, 197, 101, 191,
135, 220, 174, 153, 179,
110, 210, 109, 122, 160,
209, 103, 176, 180, 216,
169, 238, 213, 247, 173,
145, 133, 157, 198, 244,
105, 192, 171, 217, 189
201
(ZONE 7)
(PUMP STATIONS)
117, 200, 162,
118, 193, 235,
107, 106
(ZONE 2)
(PUMP STATIONS)
269, 165, 167, 184, 224
222, 257, 214, 233, 104
181, 232, 136, 164, 252,
253, 228, 131, 161, 183,
205, 182, 132, 170, 221,
156, 178, 102, 128, 151,
149, 112, 194, 134, 152,
203, 206, 111, 172
(ZONE 8)
PUMP STATIONS
124, 125,
204
ZONE 4
KRAUS STREET
PUMP STATION
(ZONE 10)
PUMP STATIONS
121
HOOKER POINT
PUMP STATION
( )
(ZONE 9)
PUMP STATION - OPERATING:
GENERAL (4441); KEEPER TIME (4442);
COLLECTION SYSTEM - PREVENTATIVE MAINTENANCE
GENERAL (4211, SYSTEM INSP (4212); LINE CLEANING
TR. & INT (4213); LINE CLEANING LATERALS (4214);
TV INSP & SEALING (4215);
COLLECTION SYSTEM - MAINTENANCE
GENERAL (4221), TRK & INT. (4222); LATERALS (4223);
SVC TERM (4224); EMER SVC (4225); MANHOLE REHAB (4226);
MANHOLE RAISING (4227); OVERFLOW CONTROL (4446);
MISC SMALL JOBS (4900-4999 & 6001-6999).
TREATMENT
HOOKER POINT
PLANT
OPERATIONS:
GENERAL (4421); AWT PILOT PLT (4422);
SOLID PROCESS (4424); LIQUID PROCESS (4425);
NITROGEN PROCESS (4426); PHOSPHORUS PROCESS (4427);
BOD PROCESS (4428); FUEL USAGE (4430); STP GENERAL
(0000); JUNCTION CHAMBER NO.1 (0020); . . . . SOLIDS
HANDLING PILOT PROGRAM (0630)
PREVENTATIVE MAINTENANCE:
STP GENERAL (0006); JUNCTION CHAMBER NO.1 (0026);
. . . . SOLIDS HANDLING PILOT PROGRAM (0636)
PLANT MAINTENANCE:
STP GENERAL (0007); JUNCTION CHAMBER NO.1 (0027);
. . . . SOLIDS HANDLING PILOT PROGRAM (0637)
AWT PLANT - 4th WIP:
SURVEY (7000); CONTRACT ADM (7001); ENGINEERING
(7002); INSPECTION (7003)
INFILTRATION INFLOW PROGRAM:
FIELD COORD (7200); TV INSPECT (7201);
LINE SEALING (7202); LINE CLEANING (7203);
ENGINEERING (7204); RPT PREPARATION (7205);
FLOW MEASURING (7206); WATER LEVEL MONITORING
(7207); SMOKE INSP. (7208); REPAIRS (7209)
USF PLANT
OPERATIONS:
USF (4423)
LABORATORY OPERATIONS
LAB SERVICES (4429)
DISPOSAL
SUPPORT SERVICES
ADMINISTRATIVE OPERATIONS:
GENERAL (4001), EXECUTIVE (4002); CUSTOMER SVC (4003);
ACCOUNTING (4004); CONTRACT ADM (4005); CODING (4006);
SPOT CHECKING (4007); BATCHING (4008); TRANS VERIF & SIGN
OFF (4009); SICK LEAVE (4830). . . . UNION ACTIVITIES (4828)
ENGINEERING OPERATIONS:
GENERAL (4101); INSP GENERAL (4103), INSP UTIL (4104);
INSP ENVELOPER (4105); INSP & SURVEY TRAINING (4106);
ENGINEERING SURVEY:
GENERAL (4102)
ENGINEERING PLANNING:
GENERAL (4111); FLOW MEASURING (4112)
ENGINEERING DESIGN
GENERAL (4121); DEVELOPER REVIEW (4122); UTIL REVIEW (4123);
ENGINEERING LEAVE CONTROL:
SICK LEAVE (4830). . . . . ADMIN LEAVE (4817)
MAINTENANCE - YARD - ADMIN:
OPERATING (4201), EQUIPMENT CONTROL (4202); MATERIAL
CONTROL (4203); DISPATCHER (4204); KEEPER TIME (4205);
TRAINING (4206); SICK LEAVE (4840). . . . UNION
ACTIVITIES (4848)
TREATMENT DIV - ADMIN:
TRAINING (4400); GENERAL (4401); SICK LEAVE (4800). . .
. . ADMIN LEAVE (4807)
TREATMENT - TECHNICAL SVCS:
GENERAL (4402); INDUST.WASTE GENERAL (4405); INDUST. WAS
FIELD (4406); DRW STORM WATER ANALYSIS (4407); SANITARY
SAMPLING (4408); BAY STUDY (4403); SEA GRANT (4404)
MATERIAL HANDLING:
ADMIN (4431), RECEIVING (4432); ISSUING (4433)
MAINTENANCE-EQUIPMENT CONTROL:
TRUCKS (4700); 3M DUMP TRUCK (4701); . . . SUPERVISION
(4720)

Figure 26.

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through 7. Changes in the output reports either made them easier to read or adjusted them to meet the configuration of Tampa's utilities. The layout of the four levels of reports for the Water Department is shown in Figure 27 and for the Sanitary Sewer Department in Figure 28.

Some examples of changes to the output reports are listed below:

Level I - Format slighty changed for clarity.
Level II - Format changed for Tampa budget configuration.
Level III- Format changed because of difference between KCWD and Tampa accounting systems. For water the report is expanded to include cost by each type of expense.
Level IV - Report greatly expanded because of increase in cost centers and accounts (object code).
For water the report is expanded to include cost by each type of expense.

The interface of the MARS cost center concept with the FIN operation, the physical layout of the utility, the four levels of MARS reports and the approval of the concept by the Directors of the Water Department and Sanitary Sewer Department completed the Systems Development phase.

Scheduling--

The original schedule called for the system development phase to be completed by September 30, 1980; however, it was not completed until the end of November for the Water Department and the end of December for the Sanitary Sewer Department. The additional time was required due to the complexity of the Tampa systems; the accounting, opeational, and management differences between the Water and Sanitary Sewer Departments; and the complexity of FIN, including the difficulties of limited documentation of the way it was operating at the time of the study. Considerable time was also spent in identifying a point where MARS data could be obtained from FIN.

Another time consumer was the need for developing new cost center concepts for both the Water and the Sanitary Sewer Departments. As previously discussed, it was necessary to use a cost center arrangement different from the KCWD concept and to fit the new arrangement within existing department and FIN constraints. A third time consuming factor was the search for alternatives that would provide Tampa management with the type of information they desired, while at the same time remaining within the confines of the original MARS concepts and computer programs. The type of expense requested by the Water Department is an example that caused some computer program structure change.

To make MARS reports more useful, it was decided to incorporate some program enhancements during the conversion rather than modifying the programs at a later date. An example of one of the enhancements is the inclusion of the types of expenses for the Water Department reports. Originally, during the first year, the conversion of programs would have been made so that the Water Department would receive reports with cost

Level I

DATE: XXXXX, XX, XXXX

SUMMARY OF SYSTEMS INFORMATION
FOR
TAMPA WATER DEPARTMENT

PAGE: 1

CATEGORY ********	ACQUISITION **********	PURIFICATION **********	DELIVERY ********	SUPPORT *******	TOTAL *****
UNIT COST $/MG					
CURRENT PERIOD					
PREVIOUS PERIOD					
CURRENT PERIOD PREVIOUS YEAR					
CURRENT YEAR (YTD)					
PREVIOUS YEAR (YTD)					
TOTAL COST					
CURRENT PERIOD					
YEAR TO DATE					
PERCENT OF TOTAL					
CURRENT YEAR TO DATE					
PREVIOUS YEAR (YTD)					

****

	TREATED WATER (MG) **********	REVENUE PRODUCING WATER (MG) **********	UNACCOUNTED FOR WATER (MG) **********
CURRENT PERIOD			
YEAR TO DATE			

Figure 27.

Level II

LAST ENTRY: XXXX
RPT PERIOD: XXXX
YTD START : XXXX

COST COMPARISON REPORT
FOR
TAMPA WATER DEPARTMENT

PAGE: 1

COMPARISON OF ACTUAL COST TO PRIOR YEAR
COST CATEGORIES

	ACTUAL COSTS	ACTUAL COSTS	VARIANCE	YEAR TO DATE
	CURRENT PERIOD (YTD)	PREVIOUS YEAR (YTD)	BALANCE	PERCENT
ACQUISITION				
PAYROLL COSTS FOR OPERATING SUPERVISION (*)				
EXECUTIVE SALARIES				
REGULAR SALARIES				
CETA				
OTHER LABOR				
BENEFITS - EXECUTIVE & REGULAR				
BENEFITS - CETA				
OTHER DIRECT COSTS FOR OPERATING SUPERVISION (*)				
GENERAL				
REPAIR & MAINTENANCE				
CHEMICALS				
POWER				
DEPRECIATION				
TOTAL COST OF ACQUISITION				
PURIFICATION				
PAYROLL COSTS FOR OPERATING SUPERVISION (*)				
EXECUTIVE SALARIES				
REGULAR SALARIES				
CETA				
OTHER LABOR				
BENEFITS - EXECUTIVE & REGULAR				
BENEFITS - CETA				
OTHER DIRECT COSTS FOR OPERATING SUPERVISION (*)				
GENERAL				
REPAIR & MAINTENANCE				
CHEMICALS				
POWER				
DEPRECIATION				
TOTAL COST OF PURIFICATION				
DELIVERY				
PAYROLL COSTS FOR OPERATING SUPERVISION (*)				
EXECUTIVE SALARIES				
REGULAR SALARIES				
CETA				
OTHER LABOR				
BENEFITS - EXECUTIVE & REGULAR				
BENEFITS - CETA				
OTHER DIRECT COSTS FOR OPERATING SUPERVISION (*)				
GENERAL				
REPAIR & MAINTENANCE				
CHEMICALS				
POWER				
DEPRECIATION				
TOTAL COST OF DELIVERY				

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Figure 27 (cont'd)

Level II

COST COMPARISON REPORT
FOR
TAMPA WATER DEPARTMENT

PAGE: 2

LAST ENTRY: XXXX
RPT PERIOD: XXXX
YTD START : XXXX

COMPARISON OF ACTUAL COST TO PRIOR YEAR COST CATEGORIES	ACTUAL COSTS CURRENT PERIOD (YTD)	ACTUAL COSTS PREVIOUS YEAR (YTD)	VARIANCE BALANCE	YEAR TO DATE PERCENT
SUPPORT SERVICES				
PAYROLL COSTS FOR OPERATING SUPERVISION (*)				
EXECUTIVE SALARIES				
REGULAR SALARIES				
CETA				
OTHER LABOR				
BENEFITS - EXECUTIVE & REGULAR				
BENEFITS - CETA				
OTHER DIRECT COSTS OPERATING SUPERVISION (*)				
GENERAL				
REPAIR & MAINTENANCE				
CHEMICALS				
POWER				
DEPRECIATION				
TOTAL COST OF SUPPORT SERVICES				
TOTAL COST OF ALL ITEMS				

(*) REPORTS WILL BE PRODUCED WITH MAJOR HEADINGS OF: OPERATING SUPERVISION
OPERATING ENGINEERING
OPERATING GENERAL
MAINTENANCE SUPERVISION
MAINTENANCE ENGINEERING
MAINTENANCE GENERAL

Figure 27 (cont'd)

Level II

LAST ENTRY: XXXX
RPT PERIOD: XXXX
YTD START : XXXX

COST COMPARISON REPORT
FOR
TAMPA WATER DEPARTMENT

PAGE: 1

COMPARISON OF ACTUAL COST TO BUDGET
BUDGET CATEGORIES

ACCT #	ACCOUNT NAME	ACTUAL COSTS CURRENT PERIOD	ACTUAL COSTS YR TO DATE	BUDGETED COSTS YR TO DATE	BUDGETED COSTS ANNUAL AMT	VARIANCE YEAR TO DATE BALANCE	VARIANCE YEAR TO DATE PERCENT
PRODUCTION ADMINISTRATION (**)							
1100	EXECUTIVE SALARIES						
1201	REGULAR SALARIES						
1202	TERMINAL LEAVE						
1203	SERVICE LEAVE						
1204	OUT OF GRADE PAY						
1206	CETA OVERMATCH						
1300	OTHER SALARIES						
1301	CETA SALARIES						
1302	CETA TERMINAL LEAVE						
1303	CETA ALTERNATE PAY						
1400	OVERTIME PAY						
1500	INCENTIVE PAY						
1600	LABOR OVERHEAD						
1700	CETA SALARIES - DEPT						
1800	CETA BENEFITS						
2200	PENSION CONTRIBUTIONS						
2201	PENSION PAYMENTS						
2300	LIFE INSURANCE						
2301	AD&D INSURANCE						
2302	HEALTH INSURANCE						
2400	WORKMAN'S COMPENSATION						
2500	UNEMPLOYMENT COMPENSATION						
3100	PROFESSIONAL SVCS - EMPLOYEES						
3101	PROFESSIONAL SERVICES						

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Figure 27 (cont'd)

Level II

LAST ENTRY: XXXX
RPT PERIOD: XXXX
YTD START : XXXX

COST COMPARISON REPORT
FOR
TAMPA WATER DEPARTMENT

COMPARISON OF ACTUAL COST TO BUDGET BUDGET CATEGORIES		ACTUAL COSTS		BUDGETED COSTS		VARIANCE	YEAR TO DATE
ACCT #	ACCOUNT NAME	CURRENT PERIOD	YR TO DATE	YR TO DATE	ANNUAL AMT	BALANCE	PERCENT
PRODUCTION ADMINISTRATION (**)							
3200	AUDITING						
3300	COURT REPORTER						
3400	LAUNDRY						
3401	CONTRACTURAL SERVICES						
4000	TRAVEL						
4001	MOTOR POOL						
4002	AUTO ALLOWANCE						
4100	TELEPHONE						
4200	CITY BUS RENT						
4202	MAILROOM						
4203	POSTAGE						
4300	UTILITIES - CITY						
4301	UTILITIES - OTHER						
4302	INCINERATOR						
4303	LANDFILL - COUNTY						
4400	RENT						
4401	RENT - CURTIS HIXON						
4500	SURETY & INDEMNITY BONDS						
4501	INSURANCE						
4502	INSURANCE - INTERDEPARTMENTAL						
4503	PAID TO CLAIMANTS						
4600	REPAIR - CONTRACTORS						
4601	REPAIRS - BUILDING MAINTENANCE						

Figure 27 (cont'd)

Level III

PERIOD ENDING: XXXXX XX, XXXX

SUMMARY OF COSTS BY FUNCTION
FOR
TAMPA WATER DEPARTMENT

COST CATEGORY		FUNCTION:	ACQUISITION	PURIFICATION	DELIVERY	SUPPORT SERVICES	TOTAL
**********			**********	**********	********	********	*****
PAYROLL COSTS FOR OPERATING SUPERVISION							
EXECUTIVE SALARIES	(1100)	CURRENT YTD	$	$	$	$	$
REGULAR SALARIES	(1201, 1204, 1300, 1400, 1500)	CURRENT YTD					
CETA	(1206, 1301, 1303, 1302, 1700)	CURRENT YTD					
OTHER LABOR	(1600)	CURRENT YTD					
BENEFITS-EXEC.& REG.	(1202, 1203, 2200, 2201, 2300, 2301, 2302, 2400, 2500)	CURRENT YTD					
BENEFITS-CETA	(1800)	CURRENT YTD					
TOTAL PAYROLL COST FOR OPERATING SUPERVISION		CURRENT YTD	$	$	$	$	$
OTHER DIRECT COSTS FOR OPERATING SUPERVISION							
OPERATING EXPENSES:							
GENERAL	(3100-4300, 4302-4506, 4700-4900, 4902-5200, 5202-5300)	CURRENT YTD	$	$	$	$	$
POWER	(4301)	CURRENT YTD					
REPAIR & MAINTENANCE	(4600-4601)	CURRENT YTD					
CHEMICALS	(5201)	CURRENT YTD					
TOTAL OTHER DIRECT COST FOR OPERATING SUPERVISION		CURRENT YTD	$	$	$	$	$
DEPRECIATION	(4901)	CURRENT YTD	$	$	$	$	$
TOTAL PAYROLL AND OTHER DIRECT COST FOR OPERATING SUPERVISION		CURRENT YTD	$	$	$	$	$

Figure 27 (cont'd)

Level IV
DATE: XXXXX XX, XXXX

DETAIL OF SUPPORT SERVICES
COST BY COST CENTERS FOR
TAMPA WATER DEPARTMENT

COST CATEGORY DESCRIPTIONS	********** SUPPORT SERVICES **********			
	DIRECTOR	ADMINISTRATIVE & FISCAL	ENGINEERING	EPA COOPERATIVE AGREEMENT
	( ) $	( ) $	( ) $	( ) $
OPERATING SUPERVISION				
EXECUTIVE SALARIES (1100)				
REGULAR SALARIES (1201)				
TERMINAL LEAVE (1202)				
SERVICE LEAVE (1203)				
OUT OF GRADE PAY (1204)				
CETA OVERMATCH (1206)				
OTHER SALARIES (1300)				
CETA SALARIES (1301)				
CETA TERMINAL LEAVE (1302)				
CETA ALTERNATE PAY (1303)				
OVERTIME PAY (1400)				
INCENTIVE PAY (1500)				
LABOR OVERHEAD (1600)				
CETA SALARIES - DEPT (1700)				
CETA BENEFITS (1800)				
PENSION CONTRIBUTIONS (2200)				
PENSION PAYMENTS (2201)				
LIFE INSURANCE (2300)				
AD&D INSURANCE (2301)				
HEALTH INSURANCE (2302)				
WORKMAN'S COMPENSATION (2400)				
UNEMPLOYMENT COMPENSATION (2500)				
PROFESSIONAL SVCS - EMPLOYEES (3100)				
PROFESSIONAL SERVICES (3101)				

Figure 27 (cont'd)

Level IV
DATE: XXXXX XX, XXXX

DETAIL OF DELIVERY COST BY
COST CENTERS FOR
TAMPA WATER DEPARTMENT

COST CATEGORY DESCRIPTIONS	********** DELIVERY ********** PUMPING			
	HILLSBOROUGH RIVER HIGH LIFT PUMPING ( ) $	MORRIS BRIDGE HIGH LIFT PUMPING ( ) $	NORTHWEST REPUMPING ( ) $	INTERBAY REPUMPING ( ) $
OPERATING SUPERVISION				
EXECUTIVE SALARIES (1100)				
REGULAR SALARIES (1201)				
TERMINAL LEAVE (1202)				
SERVICE LEAVE (1203)				
OUT OF GRADE PAY (1204)				
CETA OVERMATCH (1206)				
OTHER SALARIES (1300)				
CETA SALARIES (1301)				
CETA TERMINAL LEAVE (1302)				
CETA ALTERNATE PAY (1303)				
OVERTIME PAY (1400)				
INCENTIVE PAY (1500)				
LABOR OVERHEAD (1600)				
CETA SALARIES - DEPT (1700)				
CETA BENEFITS (1800)				
PENSION CONTRIBUTIONS (2200)				
PENSION PAYMENTS (2201)				
LIFE INSURANCE (2300)				
AD&D INSURANCE (2301)				
HEALTH INSURANCE (2302)				
WORKMAN'S COMPENSATION (2400)				
UNEMPLOYMENT COMPENSATION (2500)				
PROFESSIONAL SVCS - EMPLOYEES (3100)				
PROFESSIONAL SERVICES (3101)				

Figure 27 (cont'd)

Level IV
DATE: XXXXX XX, XXXX

DETAIL OF PURIFICATION COST
BY COST CENTER FOR
TAMPA WATER DEPARTMENT

COST CATEGORY DESCRIPTIONS	********** PURIFICATION ********** HILLSBOROUGH RIVER SYSTEM				
	RIVER TREATMENT $	HILLSBOROUGH PLANT TREATMENT $	HILLSBOROUGH PLANT FILTERING $	HILLSBOROUGH PLANT SLUDGE PROCESSING $	HILLSBOROUGH PLANT LAB & TECHNICAL $
OPERATING SUPERVISION					
EXECUTIVE SALARIES (1100)					
REGULAR SALARIES (1201)					
TERMINAL LEAVE (1202)					
SERVICE LEAVE (1203)					
OUT OF GRADE PAY (1204)					
CETA OVERMATCH (1206)					
OTHER SALARIES (1300)					
CETA SALARIES (1301)					
CETA TERMINAL LEAVE (1302)					
CETA ALTERNATE PAY (1303)					
OVERTIME PAY (1400)					
INCENTIVE PAY (1500)					
LABOR OVERHEAD (1600)					
CETA SALARIES - DEPT (1700)					
CETA BENEFITS (1800)					
PENSION CONTRIBUTIONS (2200)					
PENSION PAYMENTS (2201)					
LIFE INSURANCE (2300)					
AD&D INSURANCE (2301)					
HEALTH INSURANCE (2302)					
WORKMAN'S COMPENSATION (2400)					
UNEMPLOYMENT COMPENSATION (2500)					
PROFESSIONAL SVCS - EMPLOYEES (3100)					
PROFESSIONAL SERVICES (3101)					

Figure 27 (cont'd)

Level IV
DATE: XXXXX XX, XXXX

DETAIL OF ACQUISITION COST
BY COST CENTERS FOR
TAMPA WATER DEPARTMENT

COST CATEGORY DESCRIPTIONS	ACQUISITION HILLSBOROUGH RIVER SYSTEM				
	SULPHUR SPRINGS INTAKE & PUMPING	SULPHUR SPRINGS RAW TRANSMISSION	DAM	DAM GROUNDS & BUILDING	DAM HOUSE
	$ ( )	$ ( )	$ ( )	$ ( )	$ ( )
OPERATING SUPERVISION					
EXECUTIVE SALARIES (1100)					
REGULAR SALARIES (1201)					
TERMINAL LEAVE (1202)					
SERVICE LEAVE (1203)					
OUT OF GRADE PAY (1204)					
CETA OVERMATCH (1206)					
OTHER SALARIES (1300)					
CETA SALARIES (1301)					
CETA TERMINAL LEAVE (1302)					
CETA ALTERNATE PAY (1303)					
OVERTIME PAY (1400)					
INCENTIVE PAY (1500)					
LABOR OVERHEAD (1600)					
CETA SALARIES - DEPT (1700)					
CETA BENEFITS (1800)					
PENSION CONTRIBUTIONS (2200)					
PENSION PAYMENTS (2201)					
LIFE INSURANCE (2300)					
AD&D INSURANCE (2301)					
HEALTH INSURANCE (2302)					
WORKMAN'S COMPENSATION (2400)					
UNEMPLOYMENT COMPENSATION (2500)					
PROFESSIONAL SVCS - EMPLOYEES (3100)					
PROFESSIONAL SERVICES (3101)					

Figure 27 (cont'd)

Level I

DATE: XXXXX XX, XXXX

SUMMARY OF SYSTEMS INFORMATION
FOR
TAMPA SANITARY SEWER DEPARTMENT

PAGE: 1

CATEGORY ********	COLLECTION **********	TREATMENT *********	DISPOSAL ********	SUPPORT *******	TOTAL *****
UNIT COST $/MG					
CURRENT PERIOD	$	$	$	$	$
PREVIOUS PERIOD					
CURRENT PERIOD PREVIOUS YEAR					
CURRENT YEAR (YTD)					
PREVIOUS YEAR (YTD)					
TOTAL COST					
CURRENT PERIOD	$	$	$	$	$
YEAR TO DATE					
PERCENT OF TOTAL					
CURRENT YEAR TO DATE					
PREVIOUS YEAR (YTD)					

****

TREATED WASTEWATER CURRENT PERIOD (MG) **********	TREATED WASTEWATER YEAR TO DATE (MG) **********	PUMPED EFFLUENT CURRENT PERIOD (MG) **********	PUMPED EFFLUENT YEAR TO DATE (MG) **********	PUMPED EFFLUENT PREV. YEAR TO DATE (MG) **********

Figure 28.

Level II

LAST ENTRY: XXXX
RPT PERIOD: XXXX
YTD START : XXXX

COMPARISON OF ACTUAL COST TO PRIOR YEAR
COST CATEGORIES

COST COMPARISON REPORT
FOR
TAMPA SANITARY SEWER DEPARTMENT

	ACTUAL COSTS CURRENT PERIOD (YTD)	ACTUAL COSTS PREVIOUS YEAR (YTD)	VARIANCE BALANCE	YEAR TO DATE PERCENT
COLLECTION				
EXECUTIVE SALARIES				
REGULAR SALARIES				
CETA				
OTHER LABOR				
BENEFITS - EXECUTIVE & REGULAR				
BENEFITS - CETA				
OTHER DIRECT COSTS				
GENERAL				
REPAIR & MAINTENANCE				
CHEMICALS				
POWER				
DEPRECIATION				
TOTAL COST OF COLLECTION				
TREATMENT				
EXECUTIVE SALARIES				
REGULAR SALARIES				
CETA				
OTHER LABOR				
BENEFITS - EXECUTIVE & REGULAR				
BENEFITS - CETA				
OTHER DIRECT COSTS				
GENERAL				
REPAIR & MAINTENANCE				
CHEMICALS				
POWER				
DEPRECIATION				
TOTAL COST OF TREATMENT				
DISPOSAL				
EXECUTIVE SALARIES				
REGULAR SALARIES				
CETA				
OTHER LABOR				
BENEFITS - EXECUTIVE & REGULAR				
BENEFITS - CETA				
OTHER DIRECT COSTS				
GENERAL				
REPAIR & MAINTENANCE				
CHEMICALS				
POWER				
DEPRECIATION				
TOTAL COST OF DISPOSAL				

Figure 28 (cont'd)

Level II

LAST ENTRY: XXXX
RPT PERIOD: XXXX
YTD START : XXXX

COST COMPARISON REPORT
FOR
TAMPA SANITARY SEWER DEPARTMENT

COMPARISON OF ACTUAL COST TO BUDGET
BUDGET CATEGORIES

ACCT #	ACCOUNT NAME	ACTUAL COSTS		BUDGETED COSTS		VARIANCE YEAR TO DATE	
		CURRENT PERIOD	YR TO DATE	YR TO DATE	ANNUAL AMT	BALANCE	PERCENT
1100	EXECUTIVE SALARIES						
1201	REGULAR SALARIES						
1202	TERMINAL LEAVE						
1203	SERVICE LEAVE						
1204	OUT OF GRADE PAY						
1206	CETA OVERMATCH						
1300	OTHER SALARIES						
1301	CETA SALARIES						
1302	CETA TERMINAL LEAVE						
1303	CETA ALTERNATE PAY						
1400	OVERTIME PAY						
1500	INCENTIVE PAY						
1600	LABOR OVERHEAD						
1700	CETA SALARIES - DEPT						
1800	CETA BENEFITS						
2200	PENSION CONTRIBUTIONS						
2201	PENSION PAYMENTS						
2300	LIFE INSURANCE						
2301	AD&D INSURANCE						
2302	HEALTH INSURANCE						
2400	WORKMAN'S COMPENSATION						
2500	UNEMPLOYMENT COMPENSATION						
3100	PROFESSIONAL SVCS - EMPLOYEES						
3101	PROFESSIONAL SERVICES						

Figure 28 (cont'd)

Level III

PERIOD ENDING: XXXXX XX, XXXX

SUMMARY OF COSTS BY FUNCTION FOR TAMPA SANITARY SEWER DEPARTMENT

COST CATEGORY		FUNCTION:	COLLECTION	TREATMENT	DISPOSAL	SUPPORT SERVICES	TOTAL
**********			**********	*********	********	********	*****
PAYROLL COSTS							
EXECUTIVE SALARIES	(1100)	CURRENT	$	$	$	$	$
		YTD					
REGULAR SALARIES	(1201, 1204, 1300, 1400, 1500)	CURRENT					
		YTD					
CETA	(1206, 1207, 1301, 1302, 1303, 1304, 1700)	CURRENT					
		YTD					
OTHER LABOR	(1600, 1900)	CURRENT					
		YTD					
BENEFITS-EXEC.& REG.	(1202, 1203, 2200, 2201,2202 2300, 2301, 2302, 2400, 2500)	CURRENT					
		YTD					
BENEFITS-CETA	(1800, 2401)	CURRENT					
		YTD					
TOTAL PAYROLL COST		CURRENT	$	$	$	$	$
		YTD					
OTHER DIRECT COSTS							
OPERATING EXPENSES:							
GENERAL	(3100-4300, 4302-4506, 4700-4900, 4902-5200, 5202-5300)	CURRENT	$	$	$	$	$
		YTD					
POWER	(4301)	CURRENT					
		YTD					
REPAIR & MAINTENANCE	(4600-4601)	CURRENT					
		YTD					
CHEMICALS	(5201)	CURRENT					
		YTD					
TOTAL OTHER DIRECT COST		CURRENT	$	$	$	$	$
		YTD					
TOTAL PAYROLL AND OTHER DIRECT COST		CURRENT	$	$	$	$	$
		YTD					
DEPRECIATION	(4901)	CURRENT	$	$	$	$	$
		YTD					
INTEREST	(7200, 7201)	CURRENT	$	$	$	$	$
		YTD					
GRAND TOTAL		CURRENT	$	$	$	$	$
		YTD					

Figure 28 (cont'd)

Level IV
DATE: XXXXX XX, XXXX

DETAIL OF COLLECTION COST
BY COST CENTERS FOR
TAMPA SANITARY SEWER DEPARTMENT

COST CATEGORY DESCRIPTIONS	********** COLLECTION ********** PUMP STATION - OPERATING					
	GENERAL (4441)	BEEPER TIME (4442)	HILLTOP (1541)	RIVER GROVE (1961)	. . . . .	HOOKER POINT PLANT STATION (0011)
EXECUTIVE SALARIES (1100)						
REGULAR SALARIES (1201)						
TERMINAL LEAVE (1202)						
SERVICE LEAVE (1203)						
OUT OF GRADE PAY (1204)						
CETA OVERMATCH (1206)						
OTHER SALARIES (1300)						
CETA SALARIES (1301)						
CETA TERMINAL LEAVE (1302)						
CETA ALTERNATE PAY (1303)						
OVERTIME PAY (1400)						
INCENTIVE PAY (1500)						
LABOR OVERHEAD (1600)						
CETA SALARIES - DEPT (1700)						
CETA BENEFITS (1800)						
PENSION CONTRIBUTIONS (2200)						
PENSION PAYMENTS (2201)						
LIFE INSURANCE (2300)						
AD&D INSURANCE (2301)						
HEALTH INSURANCE (2302)						
WORKMAN'S COMPENSATION (2400)						
UNEMPLOYMENT COMPENSATION (2500)						
PROFESSIONAL SVCS - EMPLOYEES (3100)						
PROFESSIONAL SERVICES (3101)						

Figure 28 (cont'd)

Level IV

DETAIL OF SUPPORT SERVICES
COST BY COST CENTERS FOR
TAMPA SANITARY SEWER DEPARTMENT

DATE: XXXXX XX, XXXX

COST CATEGORY DESCRIPTIONS	********** SUPPORT SERVICES ********** ADMINISTRATIVE - OPERATIONS								
	GENERAL (4001)	EXECUTIVE (4002)	CUST.SVC (4003)	ACCOUNTING (4004)	CONTRACT ADMIN. (4005)	CODING (4006)	SPOT CHECKING (4007)	BATCHING (4008)	TRANS VERIF. & SIGN OFF (4009)
EXECUTIVE SALARIES (1100)									
REGULAR SALARIES (1201)									
TERMINAL LEAVE (1202)									
SERVICE LEAVE (1203)									
OUT OF GRADE PAY (1204)									
CETA OVERMATCH (1206)									
OTHER SALARIES (1300)									
CETA SALARIES (1301)									
CETA TERMINAL LEAVE (1302)									
CETA ALTERNATE PAY (1303)									
OVERTIME PAY (1400)									
INCENTIVE PAY (1500)									
LABOR OVERHEAD (1600)									
CETA SALARIES - DEPT (1700)									
CETA BENEFITS (1800)									
PENSION CONTRIBUTIONS (2200)									
PENSION PAYMENTS (2201)									
LIFE INSURANCE (2300)									
AD&D INSURANCE (2301)									
HEALTH INSURANCE (2302)									
WORKMAN'S COMPENSATION (2400)									
UNEMPLOYMENT COMPENSATION (2500)									
PROFESSIONAL SVCS - EMPLOYEES (3100)									
PROFESSIONAL SERVICES (3101)									

Figure 28 (cont'd)

Level IV

DATE: XXXXX XX, XXXX

DETAIL OF DISPOSAL COST BY
COST CENTERS FOR
TAMPA SANITARY SEWER DEPARTMENT

PAGE: 1-A

COST CATEGORY DESCRIPTIONS	********** D I S P O S A L **********
EXECUTIVE SALARIES (1100)	
REGULAR SALARIES (1201)	
TERMINAL LEAVE (1202)	
SERVICE LEAVE (1203)	
OUT OF GRADE PAY (1204)	
CETA OVERMATCH (1206)	
OTHER SALARIES (1300)	
CETA SALARIES (1301)	
CETA TERMINAL LEAVE (1302)	
CETA ALTERNATE PAY (1303)	
OVERTIME PAY (1400)	
INCENTIVE PAY (1500)	
LABOR OVERHEAD (1600)	
CETA SALARIES - DEPT (1700)	
CETA BENEFITS (1800)	
PENSION CONTRIBUTIONS (2200)	
PENSION PAYMENTS (2201)	
LIFE INSURANCE (2300)	
AD&D INSURANCE (2301)	
HEALTH INSURANCE (2302)	
WORKMAN'S COMPENSATION (2400)	
UNEMPLOYMENT COMPENSATION (2500)	
PROFESSIONAL SVCS - EMPLOYEES (3100)	
PROFESSIONAL SERVICES (3101)	

Figure 28 (cont'd)

Level IV

DATE: XXXXX XX, XXXX

DETAIL OF TREATMENT COST
BY COST CENTERS FOR
TAMPA SANITARY SEWER DEPARTMENT

PAGE: 1-A

COST CATEGORY DESCRIPTIONS	********** TREATMENT OPERATIONS - HOOKER POINT **********							
	GENERAL (4421)	AWT PILOT PLANT (4422)	SOLIDS PROCESS. (4424)	LIQUID PROCESS. (4425)	NITROGEN PROCESS. (4426)	PHOSPHORUS PROCESS. (4427)	BOD PROCESS. (4428)	FUEL USAGE (4430)
EXECUTIVE SALARIES (1100)								
REGULAR SALARIES (1201)								
TERMINAL LEAVE (1202)								
SERVICE LEAVE (1203)								
OUT OF GRADE PAY (1204)								
CETA OVERMATCH (1206)								
OTHER SALARIES (1300)								
CETA SALARIES (1301)								
CETA TERMINAL LEAVE (1302)								
CETA ALTERNATE PAY (1303)								
OVERTIME PAY (1400)								
INCENTIVE PAY (1500)								
LABOR OVERHEAD (1600)								
CETA SALARIES - DEPT (1700)								
CETA BENEFITS (1800)								
PENSION CONTRIBUTIONS (2200)								
PENSION PAYMENTS (2201)								
LIFE INSURANCE (2300)								
AD&D INSURANCE (2301)								
HEALTH INSURANCE (2302)								
WORKMAN'S COMPENSATION (2400)								
UNEMPLOYMENT COMPENSATION (2500)								
PROFESSIONAL SVCS - EMPLOYEES (3100)								
PROFESSIONAL SERVICES (3101)								

Figure 28 (cont'd)

centers (job codes) and accounts (object code) only. During the second year, the computer programs would have been modified to include the types of expense. The decision to include the types of expense in the initial development caused an adjustment in the computer programming schedule by moving some Phase II activity into Phase I. To maintain the same work level, some Phase I activity had to be shifted into Phase II. It must also be recognized that, as in many research and development programs, unforseen problems consumed more time than what was originally scheduled.

Computer Program Development

The system development activities were completed later than scheduled, thus necessitating a new schedule for computer program conversion. Because the Water Department planning was completed in late November, about a month ahead of the Sanitary Sewer Department, a decision was made to focus first on converting and implementing MARS computer programs for the Water Department, and then later converting the Sanitary Sewer Department computer programs. Based on this approach, the MARS for the Water Department was scheduled to be operational by the end of Phase I (May 31, 1981). The activity schedule was changed to reflect the Water Department Level I report produced in February, 1981, Level II in March, Level III in April, and Level IV in May. The Sanitary Sewer computer program conversion was given priority in June, with that system scheduled to be completed by September 30. This date coincides with the change of the fiscal year for the City, and allowed both Departments to start the new fiscal year with an operational MARS. On September 22, 1981, Act Systems, Inc. demonstrated to the City and the MARS Review Committee both the Water and Sanitary Sewer MARS output reports. These reports were produced with data from FIN. The month of October was spent refining MARS programs and improving automation so that the system would be ready in November 1981 to run the October data. Training on MARS operation was given in Tampa on November 3 and MARS was ready to receive data.

Initial Conversion--

The initial computer program activity started in early December 1980, pursuing the concept of converting the programs of the original MARS to operate on the Prime computer, and making the necessary modification to incorporate the agreed-upon Tampa changes. In early January 1981, severe programming problems were encountered because of the size and uniqueness of the Tampa operations. For example, the original MARS programs to handle the budget required serious modification because its budget information was entered once a year and was seldom changed throughout the fiscal year. The Tampa budget changes continuously and a new budget is generated monthly. Thus major program alterations were required so that the new budget could be entered monthly.

Another difficulty was encountered when the MARS data matrix was

being modified for Tampa requirements. The new Water Department matrix consisted of combinations of activity (20 digits), object (200), job (100), and item (6) code numbers. This four dimensional matrix, when expanded to the potential of each data field, has (20x200x100x6) 2,400,000 matrix points. This is compared to the KCWD's two-dimensional matrix of cost centers (100) by accounts (100), which equals 10,000 matrix points. Each matrix point, in both Tampa and KCWD, uses 40 spaces for data, since it must contain the expense for the present period, previous period, year to date (YTD), and budget for a data point. The Water Department matrix may have functioned on a large computer, but it exceeded the storage capability of the small computer. Methods were examined whereby the size of the matrix could be reduced by eliminating matrix data points that most likely would never be used. For example, the cost of chemicals would not likely be charged to transmission pipe in the delivery systems. It was quickly realized that an individual data point cannot be removed from a matrix because it is a subfunction of the items listed on the ordinate and abscissa (axes). Since the dimensions of a matrix are established by the items listed on each of the axes, the only way to change its size is to reduce the items on one or both of the axes. The alternative is to develop a new method for data storage.

An estimate of the data points that the Water Department MARS would actually use is less than 100,000. Thus, if a system other than a matrix were to be used, it appears that all of the data could be handled in significantly less computer space. But, departing from a matrix concept meant departing from the concept of converting the KCWD programs, since these programs are designed using a cross matrix.

Problems of converting KCWD programs for use in Tampa were also encountered in other areas. The Level II budget program was designed to use the same budget information for 12 months, and to gather and cumulate cost against the individual budget items monthly. There is the same requirement of gathering and cumulating monthly data, but the Tampa's budget changes are so numerous that the budget itself had to be recreated each month. Thus, the Level II budget program could not be accomplished on the basis of converting original MARS programs to the Tampa application.

A third programming conversion problem was identified. This problem related to the allocation programs. In KCWD, the allocation programs intercept all the expense elements that do not contain a cost center and allocate them to a proper cost center based on a predetermined routine. For example, if electrical expenses (account) are entered without a cost center because the expense is recorded at a single meter that provides electricity to several different cost centers, the KCWD allocation programs will allocate this electrical expense to the proper cost centers within the utility.

Since all of Tampa's data must contain a job code (cost center), no data can enter the FIN system without a cost center. However, the Water

Department wants to allocate administrative expense (a cost center) to applicable physical cost centers for which the specific administrative expense provides service.

Figure 29 is an example of the desired allocation. The first allocation shows that the Hillsborough River Treatment Administration (XX22-X) is to be distributed to in-river treatment (XX20-X), Hillsborough River treatment plant (XX21-X), etc. These are to be allocated based on the direct charges against the specific cost center for the period in which the data was collected. Thus, the Tampa requirement is different from the original MARS allocation programs.

New Programming Concept--

The problems associated with computer program conversion, receipt of input data from FIN, and differences between the Water Department and Sanitary Sewer Department input data led to the decision that it would be impractical to convert and modify the KCWD MARS program for the Tampa application. It was agreed that the best approach would be to develop new computer programs, following the original general concept of MARS as much as reasonably possible, but using new computer programming techniques. Thus, development of the new computer programming concept was started. No change was made in the plan for developing the Water Department programs first and the Sanitary Sewer programs later; however, the new development concept was for both departments.

The major programming problem to be resolved was reduction of the size of the matrix to function on the Tampa Prime computer. After several alternatives were evaluated, the solution was one of maintaining a sequential file of expense elements in the computers rather than maintaining a matrix. In using a sequential file, the data base can be constructed as expenses occur. For example, if the first repair during the year of a pump station should occur in May, that particular expense charged to the pump station cost center number would not exist in the file until May. If no expense should occur during the year for that specific cost center, a matrix point for expenses charged to the cost center would never appear in the file. Under the old matrix concept, a space in the file would always exist for that expense because the specific cost center would be listed on the abscissa and the account number on the ordinate of the axes. This approach actually eliminates the blank spaces in the matrix, drastically reducing the storage requirements. As a result, the number of data elements that will make up the complete file is expected to be less than 100,000.

Because MARS is based on a matrix concept and the new programs are to follow the MARS concept, a matrix must still be constructed from the data base. This is accomplished by special programs that produce a matrix for output report purposes. For example, the Level IV report is a matrix of cost centers versus accounts. In the original MARS, the full matrix was created in the computer and then printed. Under the new programming

ALLOCATION OF ADMINISTRATIVE COST CENTERS

1) XX22-X HILLSBOROUGH RIVER TREATMENT ADMINISTRATIVE allocated based on direct charges to:

XX20-X	IN-RIVER TREATMENT
XX21-X	HILLSBOROUGH RIVER PLANT TREATMENT
XX23-X	HILLSBOROUGH RIVER FILTERING
XX24-X	HILLSBOROUGH RIVER SLUDGE PROCESSING
XX26-X	HILLSBOROUGH RIVER LAB & TECHNICAL
XX27-X	SATELLITE WELLS TREATMENT
XX34-X	HILLSBOROUGH RIVER PLANT GROUNDS & BUILDINGS
XX43-X	NORTHWEST REPUMPING
XX44-X	INTERBAY REPUMP
XX45-X	HILLSBOROUGH RIVER CLEAR WELLS

2) XX29-X MORRIS BRIDGE ADMINISTRATIVE allocated based on direct charges to:

XX11-X	MORRIS BRIDGE WELLS
XX12-X	MORRIS BRIDGE WELLS GROUNDS & BLDGS
XX13-X	MORRIS BRIDGE LOW LIFT PUMPING
XX14-X	MORRIS BRIDGE TRANSMISSION
XX28-X	MORRIS BRIDGE TREATMENT
XX30-X	MORRIS BRIDGE FILTERING
XX31-X	MORRIS BRIDGE LAB
XX32-X	MORRIS BRIDGE PLANT GROUNDS & BLDGS
XX42-X	MORRIS BRIDGE HIGH LIFT PUMPING
XX46-X	MORRIS BRIDGE CLEAR WELLS

3) XX33-X PRODUCTION MAINTENANCE ADMINISTRATIVE allocated based on direct charges to:

XX01-5,6,7

XX48-5,6,

(excluding other administrative numbers)

4) XX41-X HILLSBOROUGH RIVER PUMPING ADMINISTRATIVE allocated based on direct charges to:

XX01-X	SULPHUR SPRINGS INTAKE & PUMPING
XX02-X	SULPHUR SPRINGS TRANSMISSION
XX06-X	HILLSBOROUGH RIVER INTAKE
XX07-X	HILLSBOROUGH RIVER LOW LIFT PUMPING
XX08-X	HILLSBOROUGH RIVER TRANSMISSION
XX40-X	HILLSBOROUGH RIVER HIGH LIFT PUMPING

Figure 29.

concept, only a portion of the matrix is created and printed at one time. The created portion of the matrix is then removed and the next adjoining section of the matrix is created and printed. This process is repeated until the total matrix is complete.

As discussed earlier, in the KCWD programs the field storage size for each matrix point is 40 spaces. In changing to the file concept, the field storage size was expanded to 58 spaces. The additional 18 spaces were necessary to carry the identifier of the expense. In other words, in the original MARS with a matrix, all data were stored at an intercept point between a cost center and an account that identified the data. If the matrix concept is not used, an identifier must be attached to the data so that its identity can be known and the report matrix can be produced later.

Figure 30 shows the field of the new storage file. As shown, the field consists of the 40 original spaces, plus 18 spaces for the identifiers. The additional spaces (identifiers) consist primarily of the information obtained from FIN from which the matrix is constructed; i.e., activity, object, job, and item codes. In addition, an identity must be assigned to the department and the type of expense recorded, i.e., expense, budget, etc.

This file, from a programming standpoint, is called the cross matrix file because it serves the same purpose as the cross matrix file in the KCWD programs.

During planning for the new program, some enhancements to the output reports were made. The Level III report and Level IIb report are the same basic output. Figure 31 is a copy of the planned Level III report for the Water Department and Figure 32 is the planned Level II Part 2 report. As can be seen, these reports contain generally the same information but in a different format. The Level III report provides the expense for the period and for the YTD to a matrix of functions (summarized cost centers) and cost categories (summarized accounts). For the same functions and cost categories, Level II Part 2 compares the current year YTD cost to the previous year YTD cost. Since the monthly value has not proven useful at KCWD, and to avoid duplication, the Level III report was replaced by Level II Part 2 report. In the unlikely event the monthly values are ever required, they can be manually produced for existing data.

Sanitary Sewer Application--

In examining the MARS computer program for the Sanitary Sewer Department application, three major differences were identified as follows:

1) The MARS code numbers in FIN are at the same field location as those for the Water Department, but the numbers have entirely different meanings, and must therefore be handled differently by the computer programs.

FILE FIELD FOR DATA STORAGE

Note No.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	
Description	Blank	Dept. Code	Activity	Object	Job	Item +	Rec	Cur. $	Prev. $	YTD $	Budget $	
Spaces	2	4	2	4	4	1	1	10	10	10	10	= Total 58
	Identifiers - 18 spaces							Original Data Elements - 40 spaces				

Note: (1) Future application

(2) Identifies Department

(3) Ties to budget

(4) Account number

(5)/(6) Cost Center/Type of Expense

(7) Type of Record (expense, budget, etc.)

(8) $ for account for this month

(9) $ for account for last month

(10) $ for account for YTD

(11) $ for budget for YTD

Figure 30

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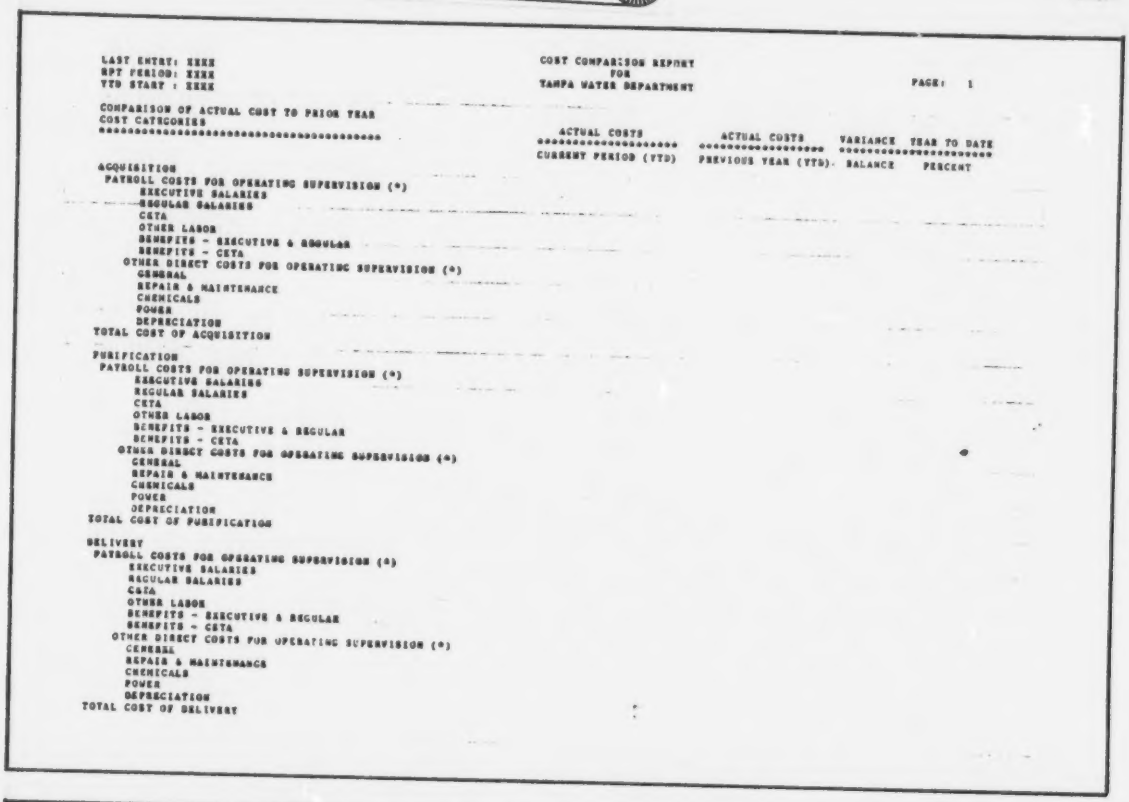


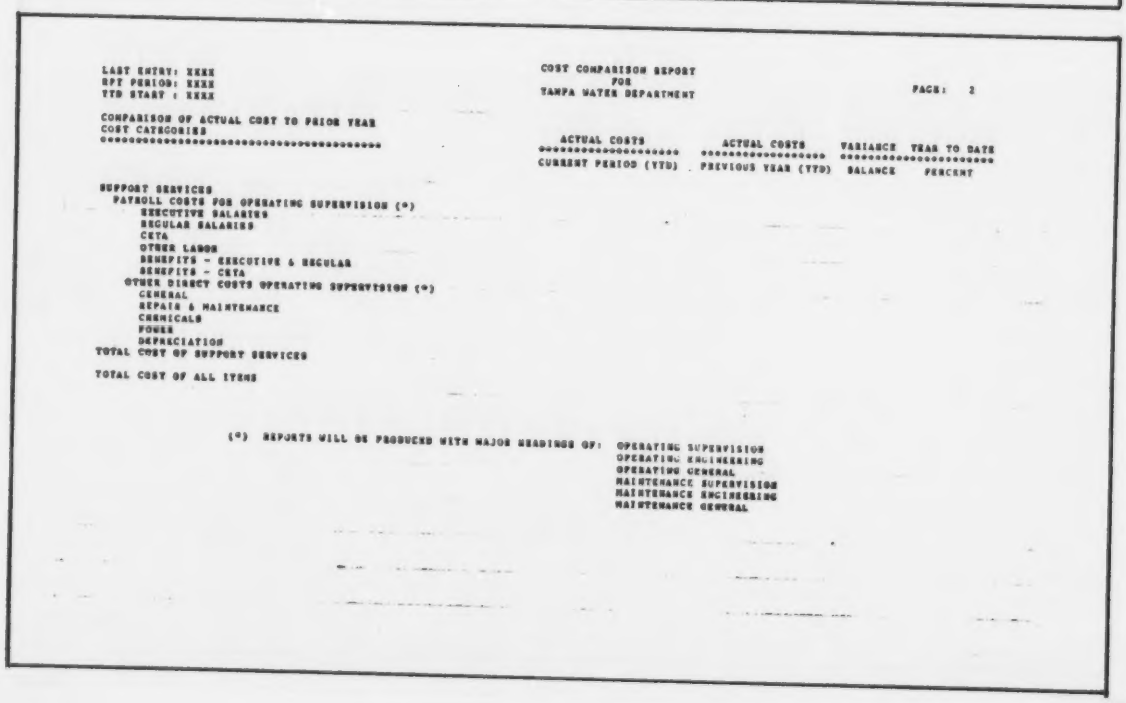
```
LAST ENTRY: XXXX                                    COST COMPARISON REPORT
RPT PERIOD: XXXX                                            FOR
YTD START : XXXX                                    TAMPA WATER DEPARTMENT                    PAGE:  1

COMPARISON OF ACTUAL COST TO PRIOR YEAR
COST CATEGORIES
**************************************          ACTUAL COSTS      ACTUAL COSTS      VARIANCE  YEAR TO DATE
                                                ********************  ********************  ********************
                                                CURRENT PERIOD (YTD)  PREVIOUS YEAR (YTD)  BALANCE   PERCENT

ACQUISITION
 PAYROLL COSTS FOR OPERATING SUPERVISION (*)
      EXECUTIVE SALARIES
      REGULAR SALARIES
      CETA
      OTHER LABOR
      BENEFITS - EXECUTIVE & REGULAR
      BENEFITS - CETA
   OTHER DIRECT COSTS FOR OPERATING SUPERVISION (*)
      GENERAL
      REPAIR & MAINTENANCE
      CHEMICALS
      POWER
      DEPRECIATION
TOTAL COST OF ACQUISITION

PURIFICATION
 PAYROLL COSTS FOR OPERATING SUPERVISION (*)
      EXECUTIVE SALARIES
      REGULAR SALARIES
      CETA
      OTHER LABOR
      BENEFITS - EXECUTIVE & REGULAR
      BENEFITS - CETA
   OTHER DIRECT COSTS FOR OPERATING SUPERVISION (*)
      GENERAL
      REPAIR & MAINTENANCE
      CHEMICALS
      POWER
      DEPRECIATION
TOTAL COST OF PURIFICATION

DELIVERY
 PAYROLL COSTS FOR OPERATING SUPERVISION (*)
      EXECUTIVE SALARIES
      REGULAR SALARIES
      CETA
      OTHER LABOR
      BENEFITS - EXECUTIVE & REGULAR
      BENEFITS - CETA
   OTHER DIRECT COSTS FOR OPERATING SUPERVISION (*)
      GENERAL
      REPAIR & MAINTENANCE
      CHEMICALS
      POWER
      DEPRECIATION
TOTAL COST OF DELIVERY
```



```
LAST ENTRY: XXXX                                    COST COMPARISON REPORT
RPT PERIOD: XXXX                                            FOR
YTD START : XXXX                                    TAMPA WATER DEPARTMENT                    PAGE:  2

COMPARISON OF ACTUAL COST TO PRIOR YEAR
COST CATEGORIES
**************************************          ACTUAL COSTS      ACTUAL COSTS      VARIANCE  YEAR TO DATE
                                                ********************  ********************  ********************
                                                CURRENT PERIOD (YTD)  PREVIOUS YEAR (YTD)  BALANCE   PERCENT

SUPPORT SERVICES
  PAYROLL COSTS FOR OPERATING SUPERVISION (*)
      EXECUTIVE SALARIES
      REGULAR SALARIES
      CETA
      OTHER LABOR
      BENEFITS - EXECUTIVE & REGULAR
      BENEFITS - CETA
   OTHER DIRECT COSTS OPERATING SUPERVISION (*)
      GENERAL
      REPAIR & MAINTENANCE
      CHEMICALS
      POWER
      DEPRECIATION
TOTAL COST OF SUPPORT SERVICES

TOTAL COST OF ALL ITEMS


              (*)  REPORTS WILL BE PRODUCED WITH MAJOR HEADINGS OF:  OPERATING SUPERVISION
                                                                    OPERATING ENGINEERING
                                                                    OPERATING GENERAL
                                                                    MAINTENANCE SUPERVISION
                                                                    MAINTENANCE ENGINEERING
                                                                    MAINTENANCE GENERAL
```

Figure 31.

PERIOD ENDING: XXXX XX, XXXX

SUMMARY OF COSTS BY FUNCTION FOR TAMPA WATER DEPARTMENT

PAGE 1

COST CATEGORY		FUNCTION:	ACQUISITION	PURIFICATION	DELIVERY	SUPPORT SERVICES	TOTAL
PAYROLL COSTS FOR OPERATING SUPERVISION							
EXECUTIVE SALARIES	(1100)	CURRENT	$	$	$	$	$
		YTD					
REGULAR SALARIES	(1201, 1204, 1300, 1400, 1500)	CURRENT YTD					
CETA	(1206, 1301, 1303, 1302, 1700)	CURRENT YTD					
OTHER LABOR	(1600)	CURRENT YTD					
BENEFITS-EXEC.& REG.	(1202, 1203, 2200, 2201, 2300, 2301, 2302, 2400, 2500)	CURRENT YTD					
BENEFITS-CETA	(1800)	CURRENT YTD					
TOTAL PAYROLL COST FOR OPERATING SUPERVISION		CURRENT YTD	$	$	$	$	$
OTHER DIRECT COSTS FOR OPERATING SUPERVISION							
OPERATING EXPENSES:							
GENERAL	(3100-4300, 4302-4304, 4700-4900, 4902-5200, 5202-5300)	CURRENT YTD	$	$	$	$	$
POWER	(4301)	CURRENT YTD					
REPAIR & MAINTENANCE	(4400-4401)	CURRENT YTD					
CHEMICALS	(5201)	CURRENT YTD					
TOTAL OTHER DIRECT COST FOR OPERATING SUPERVISION		CURRENT YTD	$	$	$	$	$
DEPRECIATION	(4901)	CURRENT YTD	$	$	$	$	$
TOTAL PAYROLL AND OTHER DIRECT COST FOR OPERATING SUPERVISION		CURRENT YTD	$	$	$	$	$

PERIOD ENDING: XXXX XX, XXXX

SUMMARY OF COSTS BY FUNCTION FOR TAMPA WATER DEPARTMENT

PAGE: 2

COST CATEGORY		FUNCTION:	ACQUISITION	PURIFICATION	DELIVERY	SUPPORT SERVICES	TOTAL
PAYROLL COSTS FOR MAINTENANCE SUPERVISION							
EXECUTIVE SALARIES	(1100)	CURRENT YTD	$	$	$	$	$
REGULAR SALARIES,	(1201, 1204, 1300, 1400, 1500)	CURRENT YTD					
CETA	(1206, 1301, 1303, 1302, 1700)	CURRENT YTD					
OTHER LABOR	(1400)	CURRENT YTD					
BENEFITS-EXEC.& REG.	(1202, 1203, 2200, 2201, 2300, 2301, 2302, 2400, 2500)	CURRENT YTD					
BENEFITS-CETA	(1800)	CURRENT YTD					
TOTAL PAYROLL COST FOR MAINTENANCE SUPERVISION		CURRENT YTD	$	$	$	$	$
OTHER DIRECT COSTS FOR MAINTENANCE SUPERVISION							
OPERATING EXPENSES:							
GENERAL	(3100-4300, 4302-4304, 4700-4900, 4902-5200, 5202-5300)	CURRENT YTD	$	$	$	$	$
POWER	(4301)	CURRENT YTD					
REPAIR & MAINTENANCE	(4400-4401)	CURRENT YTD					
CHEMICALS	(5201)	CURRENT YTD					
TOTAL OTHER DIRECT COST FOR MAINTENANCE SUPERVISION		CURRENT YTD	$	$	$	$	$
DEPRECIATION	(4901)	CURRENT YTD	$	$	$	$	$
TOTAL PAYROLL AND OTHER DIRECT COST FOR MAINTENANCE SUPERVISION		CURRENT YTD	$	$	$	$	$
GRAND TOTAL		CURRENT YTD	$	$	$	$	$

Figure 32.

2) The code numbers do not identify the type of expense, making the printout of the Level IV report different.

3) The requirement for allocation does not exist, and thus the requirement for the allocation program does not exist.

Because of the differences outlined above and other minor differences, the plan included development of a separate set of computer programs for the Sanitary Sewer Department. These programs use as much of the Water Department's software as possible, but with modifications to meet the Sanitary Sewer Department's requirements.

Program Planning Results--

The programming plan was completed and called for 65 individual programs (including tables, utilities, and command files): 33 for the Water Department and 32 for the Sanitary Sewer Department. Figure 33 is a list of the programs, with the programming activities identified as being eight steps. The eight steps are as follows:

Step 1 - Produce a disk work file from FIN Budget and Expense tape.
Step 2 - Edit input data, produce error list, and provide utility programs to correct the work file.
Step 3 - Perform the allocation process.
Step 4 - Accomplish file management, including update of the date file.
Step 5 - Produce Level I report and store required historical data.
Step 6 - Produce Level II report.
Step 7 - Produce Level III report.
Step 8 - Produce Level IV report.

Figure 34 is a simplified flow diagram of the plan for developing the new MARS program. The KCWD simplified flow is almost the same except for step 1 (obtaining source data). KCWD enters the data from source documents, whereas Tampa receives a computer tape containing processed FIN data. There are limited similarities in the internal structure of the KCWD and Tampa computer programs.

Software Development

In early March, development of the new MARS programs was started. All emphasis was placed on the Water Department and major effort was expended toward having the four levels of reports for the Water Department ready by May 31. The new plan was followed as closely as possible, but some adjustments had to be made. For example, the plan called for the allocation subroutine to be contained in one program. In the actual development, allocation was made with three separate programs.

When the first tape with FIN data was entered into the computer, some

PLANNED PROGRAMS FOR TAMPA MARS

STEP #1

(A) MAGNET
(B) MERGEDATA

STEP #2

(C) EDITDATA
(D) CORRFILE
(E) CORRTABL

STEP #3

(F) ALLOCATE

STEP #4

(G) ZERO DATA
(H) UPDATE

STEP #5

(I) LEVEL I

STEP #6

(J) LEVEL II

STEP #7

(K) LEVEL III

STEP #8

(L) LEVEL IV

TABLES

(M) ACTIVITY
(N) ACCOUNT
(O) COST CENTER
(P) EXPENSE
(Q) CATEGORY
(R) WATERDATA
(S) PREV YEAR

UTILITIES

(T) CREATE TABLES
(U) CREATE WORKFL
(V) CREATE CMF
(W) CREATE WATER
(X) CREATE PREV YR
(Y) EDIT CMF
(Z) EDIT WATER
(AA) EDIT PREV YR

COMMAND FILES

(BB) MERGE EDIT
(CC) EDIT
(DD) ALLOCATE
(EE) ZERO UPDATE
(FF) UPDATE
(GG) REPORTS

Figure 33.

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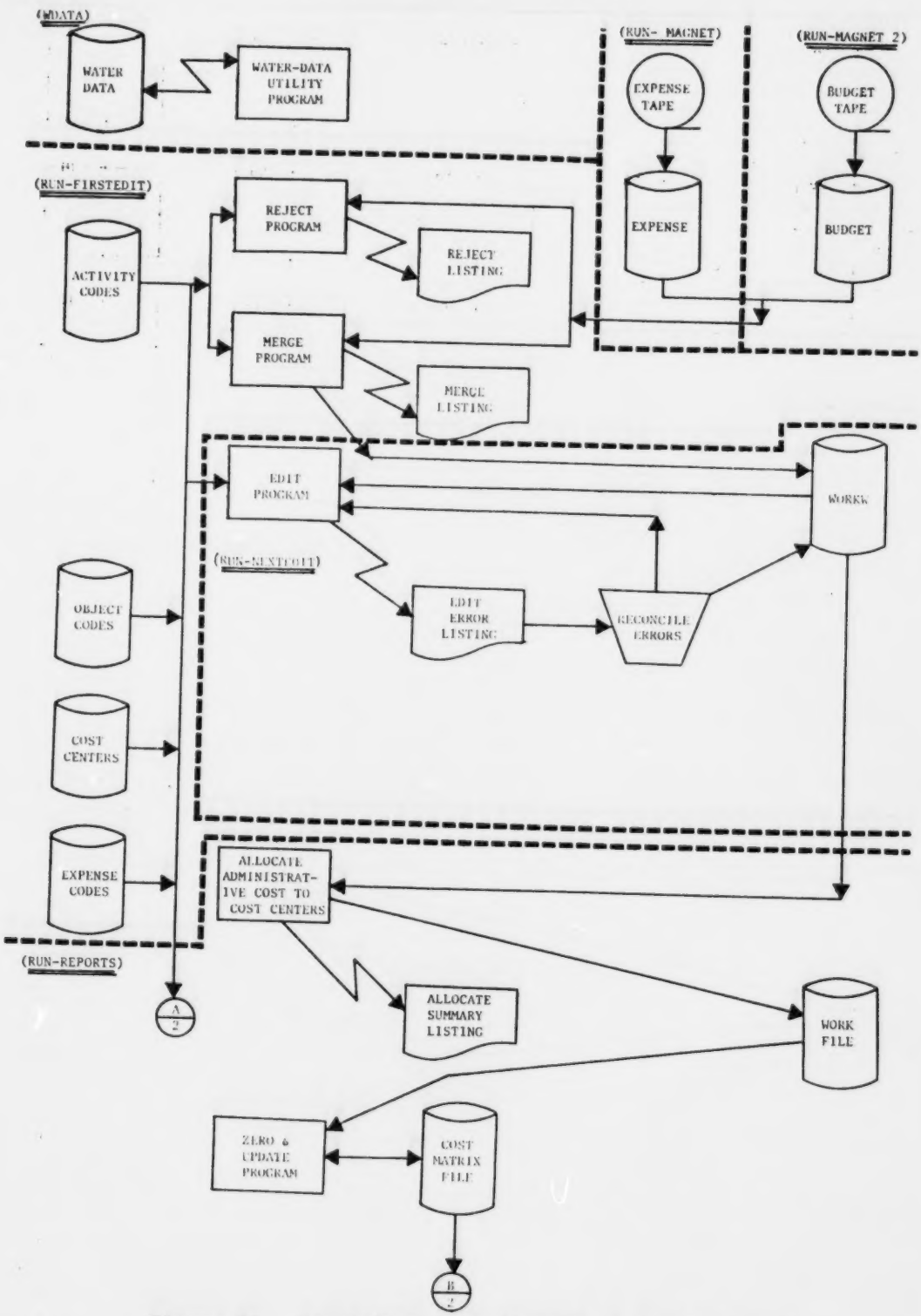

Figure 34. Simplified flow diagram of MARS programs.

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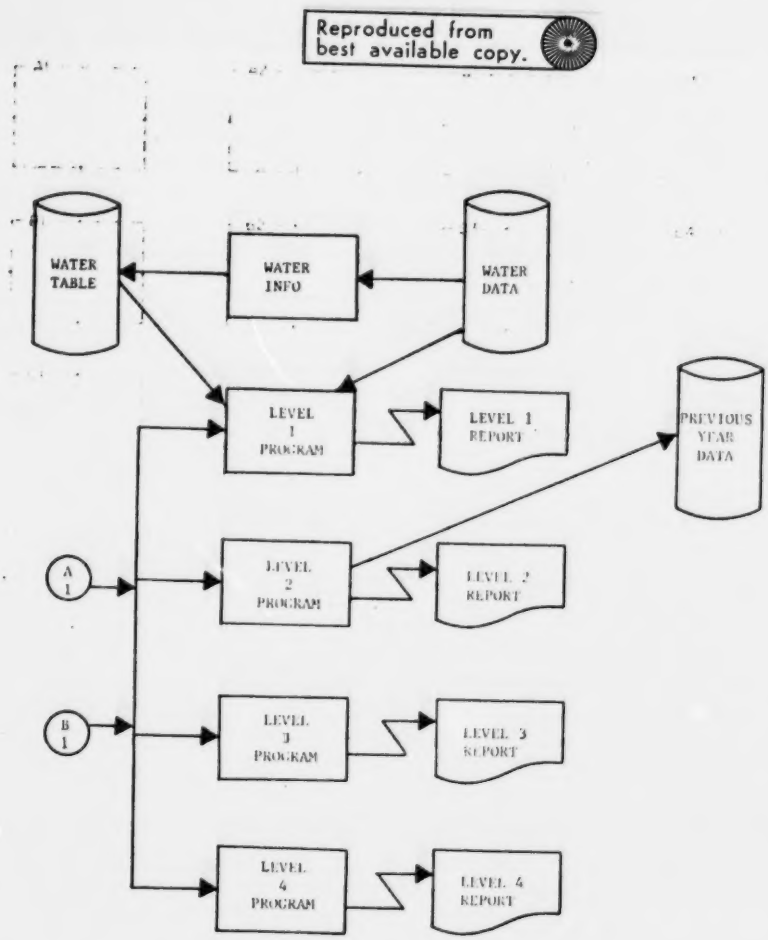

Figure 34. (continued)

difficulties were encountered. During system development activities of the FIN data concepts, incorrect information was provided. The misconceptions were first seen when the first tapes were received with FIN data. The following conditions were identified:

1) The expense records were expected to be summarized by account. However, the information was not summarized and many accounts had 10 to 15 individual entries.

2) The job/item code field (cost centers) was not to contain all "0's" or blanks. It was understood that the FIN computer program would not allow this situation to occur. Roughly 5 percent of these data elements were all "0's" and several contained blanks.

A new program that would summarize accounts was developed. Another program was modified to check the job/item code for all "0's" or blanks. The accounts found in this condition are placed on the error list for correction.

As discussed earlier, the project was originally approved for a two-year period, with one year of funding provided by EPA. Tampa applied for the second year, but that funding, along with the funding of many other EPA projects, was subjected to a federal government review aimed at reducing the EPA budget. The review put the second year of funding in question. Shortly after the end of Phase I, the project was again funded, but the two months of uncertainty did have an impact.

As a result of the uncertainty, the Sanitary Sewer Department requested that their programs be brought up to date with the Water programs. All parties agreed to shift the effort and bring the Sanitary Sewer programs to approximately the same level as the Water programs. This decision created another schedule change, by requiring both the Water and the Sanitary Sewer programs producing Levels I and II reports to be produced by the end of May, and the Levels III and IV, along with the remainder of the required Tampa MARS programs, by the end of September.

Development of the computer program progressed with minimum problems following the plan developed in February. The primary difficulty was the time constraint imposed on producing the program code and testing the programs, most of which were complex in structure.

In April because of the change in the schedule of activities, heavy emphasis was placed on the development of the Sanitary Sewer programs. On May 31, 1981, at the completion of Phase I, the Water and Sanitary Sewer programs had achieved a similar status and both departments had been provided with Level I and Level II reports. The information in the reports contained Tampa data processed by their Prime computer. However, the program that would allocate the administration expense to a cost center had not been completed and tested, and thus the Water Department reports contained no allocated data. Also, most of the errors in data had not been corrected by the Departments at that time.

From June through September, programming followed the plan shown in Figure 33. On September 22, 1981, the functioning of the MARS for both the water and sewer was demonstrated to the City and to the MARS Review Committee. The computer programs functioned properly, as designed; however, the demonstration revealed some areas where improvement could be made. Basically, these changes were in the utilities and related to the ease in which the program can be run.

The month of October was utilized for cleanup and utility modification after which the programs were ready on the Prime computer for City processing. In early November, the City received limited operational training on the system. The Water and Sanitary Sewer personnel ordered the tapes with FIN data to produce the October 1981 MARS reports (start of fiscal year). The reports were produced with actual data but the total expenses appeared to be less than anticipated for the month. An investigation showed that payroll cost had not been included on the data tape. As a result of the missing data, additional time was consumed researching the FIN system to determine why the data were not included on the MARS input tape.

A conclusion was reached to modify the program that created the input tape to retrieve the data from the CIP file within the FIN system, instead of the General Ledger file.

After obtaining the first data tape from the CIP file, it was determined that some expense elements were not retrieved. This situation existed because a specific month's transaction can be entered into the CIP several months later. For example, a February transaction can be entered in the CIP file in April. Normally, the FIN data tape for February will be produced in March, will contain elements for only February's transactions, and will only include information existing in the CIP file at the time the tape is produced. The next tape, requested in April for March data will contain elements for only March transactions. Thus, if a February transaction is entered into FIN after the February data tape was made, it will not be picked up by MARS, and would therefore cause an imbalance between MARS and FIN.

To correct this condition, the programs that create these tapes were modified to: 1) retrieve data based on the transaction date which coincides with the MARS report date, and 2) extract those other data that have a posted date with a beginning and ending range provided by the MARS operator and a transaction date of the stated month or earlier. For example, during the month of May, April tapes are requested which will include April transactions plus previous month's transactions recorded beginning with April 7th to (and including) May 7th, 1982. In essence, the tapes produced by the modified programs should contain data whose transactions dates are equal to the monthly reports being created, plus any data that was recorded during a posting period but whose transactions date is prior to the reporting period.

Another step to assist in having the major amount of data available for each month is to decide upon the best time to obtain the CIP data for the reports. A set time will give everyone a target to complete their normal inputs to FIN. The second Tuesday after the closing of the accounting month was chosen, as this will be the earliest date that the FIN data will be ready for MARS.

Part of the MARS programs edit the FIN data and identify errors. If MARS is to balance with FIN, these errors must be corrected in the CIP file of FIN. Working with people from several City departments, a correction feature to the CIP field was developed and adopted.

As the departments examined and used the MARS reports, a number of small changes were made to the computer programs. For example "Plant Flow (MG)" on the Sanitary Sewer Department report was changed to "Billable Q (MG)". Several enhancements were added to the programs as well. For the Sanitary Sewer Department a Level V report was produced (described later). This report sums the Level IV data by major cost centers. Another enhancement of the MARS progrms was to reduce the printing required to produce the Level IV report. This is accomplished in two steps. First, all account numbers that have no expenses charged to a cost center are not included in the report. Second, programs were developed to allow to examine the cost of any one cost center with any one or all of its expenses. Using these programs, information can be displayed for examination on a CRT as a printed report (Level VI).

MARS Reports

The final format of the MARS reports with Tampa data are shown in this section. The year-to-date information starts with October 1981. There is no previous-year information available because the system has not been functional for that period of time.

The Level I report for Water Department is shown in Figure 35, and for the Sanitary Sewer Department in Figure 36. This report is specifically designed for top utility management, contains operating and maintenance cost data summarized into major operational categories along with additional information useful in the evaluation of the operations of the entire utility.

The first five rows contain cost data expressed as a productivity basis with dollars over million gallons of water ($/MG) for the: 1) current month, current year; 2) previous month, current year; 3) current month, previous year; 4) year-to-date, current year; and 5) year-to-date, previous year. These unit costs may be compared in this manner to facilitate a trend analysis.

The next two rows contain the total costs for the current month and year-to-date, and the last two rows provide a percentage of total cost to each function for the current year-to-date and the previous year-to-date.

MONTH ENDING: JAN 31, 1982

SUMMARY OF SYSTEMS INFORMATION
FOR
TAMPA WATER DEPARTMENT
(LEVEL I)

CATEGORY	ACQUISITION	PURIFICATION	DELIVERY	SUPPORT	DEBT EXPENSE	DEPRECIATION	TOTAL
UNIT COST $/MG							
CURRENT MONTH	$ 9.21	$ 124.97	$ 228.16	$ 202.85	$ 158.67	$ 101.74	$ 825.60
PREVIOUS MONTH	7.28	159.23	175.07	70.62	157.95	96.06	666.21
CURRENT MONTH PREVIOUS YEAR							
CURRENT YEAR (YTD)	8.96	143.64	220.46	96.69	164.09	96.53	730.37
PREVIOUS YEAR (YTD)							
TOTAL COST							
CURRENT MONTH	$ 15,312.49	$ 207,818.07	$ 379,415.35	$ 337,328.68	$ 263,860.15	$ 169,176.94	$ 1372,911.68
YEAR TO DATE	60,430.23	968,306.22	1486,111.17	651,785.56	1106,106.74	650,725.91	4923,465.83
PERCENTAGE OF TOTAL							
CURRENT YEAR (YTD)	1.23%	19.67%	30.18%	13.24%	22.47%	13.22%	100.00%
PREVIOUS YEAR (YTD)							

TREATED WATER (MG)		REVENUE PRODUCING WATER (MG)	
CURRENT MONTH	1687.431	CURRENT MONTH	1662.910
YEAR TO DATE	7540.196	YEAR TO DATE	6740.982
PREVIOUS Y-T-D	7261.631	PREVIOUS Y-T-D	6894.851
UNACCOUNTED FOR WATER (MG)		BUDGET REMAINING (%)	
CURRENT MONTH	24.521	YEAR TO DATE	66.10
YEAR TO DATE	799.214		

Figure 35.

MONTH ENDING: JAN 31, 1982

SUMMARY OF SYSTEMS INFORMATION
FOR
TAMPA SEWER DEPARTMENT
(LEVEL I)

CATEGORY	COLLECTION	TREATMENT	DISPOSAL	SUPPORT	DEBT EXPENSE	DEPRECIATION	TOTAL
UNIT COST $/MG							
CURRENT MONTH	$ 165.47	$ 435.87	$	$ 664.81	$ 209.75	$ 283.10	$ 1,759.00
PREVIOUS MONTH	137.53	334.16		309.29	198.82	268.07	1,247.87
CURRENT MONTH PREVIOUS YEAR							
CURRENT YEAR (YTD)	146.78	385.37		411.43	218.92	281.44	1,443.94
PREVIOUS YEAR (YTD)							
TOTAL COST							
CURRENT MONTH	$ 189,845.17	$ 500,087.88	$	$ 762,750.17	$ 240,652.56	$ 324,814.17	$ 2018,149.95
YEAR TO DATE	676,361.39	1775,805.72		1895,919.02	1008,820.12	1296,884.38	6653,790.63
PERCENTAGE OF TOTAL							
CURRENT YEAR (YTD)	10.17%	26.69%	%	28.49%	15.16%	19.49%	100.00%
PREVIOUS YEAR (YTD)							

PLANT FLOW (MG)		BILLABLE Q (MG)	
CURRENT MONTH	1632.840	CURRENT MONTH	1147.329
YEAR TO DATE	6099.840	YEAR TO DATE	4608.079
PREVIOUS Y-T-D	5934.000	PREVIOUS Y-T-D	4626.000
UNBILLED FLOW (MG)		BUDGET REMAINING (%)	
CURRENT MONTH	485.511	YEAR TO DATE	65.40
YEAR TO DATE	1491.761		

Figure 36.

This provides an indication of shifts in cost and trends in areas where expenses are increasing.

Production unit information is presented at the bottom of the page, along with percent of budget funds remaining. The production Unit for the Water Department is classified as "Revenue Producing Water (RPW)", the amount of water from which revenue is derived; while the Sanitary Sewer Department uses "Billable Q", billed sewer line flow into the treatment facility.

A sample of the Level II report for the Water Department is shown in Figure 37 and for the Sanitary Sewer Department in Figure 38. Each of these reports continue for several pages to list all of the accounts for each department. This report compares the actual costs incurred with the budgeted costs. Six columns of numbers are printed. The first two columns show actual costs for the current period and year-to-date. The second two columns reflect the budget by year-to-date and annual amount. The budgeted year-to-date amount represents the annual budget prorated for the number of months expired. The fifth and sixth columns show the variance of actual cost to budgeted cost as a balance and as a percent. In the comparison of actual costs to budget, the rows of costs coincide with the general ledger chart of accounts (object codes).

A sample of the Level III report for the Water Department is shown in Figure 39, and for the Sanitary Sewer Deparment in Figure 40. Each of these reports continues for several pages to show a comparison of costs for all functions of the utility. This report provides a comparison of current year-to-date cost with the year-to-date costs for the previous year for each of the report's cost categories and prints this comparison as a variance in dollars and as a percent.

The rows representing the cost categories are grouped together by the four major utility functions. Under each function, the object codes of the FIN system are consolidated by sub-categories of operating cost and maintenance cost, but printed with corresponding object code descriptions. The major standard cost categories are: (1) payroll cost which includes executive salaries, regular salaries, CETA, other labor, benefits - executive & regular, and benefits-CETA: (2) other direct cost, which include general cost, repair & maintenance, chemical and power; (3) interest and debt service; and (4) depreciation.

A sample of the Level IV report for the Water Department is shown in Figure 41, and for the Sanitary Sewer Department in Figure 42. Since this report is rather long, only selected pages are shown in these Figures. This report provides the detailed cost activity by unique utility cost centers, thereby identifying specific cost for various components of the utility system, (i.e. for water: acquisition, purification, delivery, support services; and for sewer: collection, treatment, disposal and support services). It is presented in matrix form, with the horizontal axis representing the activity associated with object code numbers and the

REPORT DATE: JAN 31, 1982

COST COMPARISON REPORT
FOR
TAMPA WATER DEPARTMENT
(LEVEL II)

COMPARISON OF ACTUAL COST TO BUDGET

BUDGET CATEGORIES		ACTUAL COSTS		BUDGETED COSTS		BUDGET REMAINING	
ACCT # ACCOUNT NAME		CURR PERIOD	YEAR TO DATE	YR TO DATE	ANNUAL AMT	AMOUNT	PERCENT
OFFICE OF DIRECTOR (26)							
1100 EXECUTIVE SALARIES				10,920.00	32,760.00	32,760.00	
1201 REGULAR SALARIES		6,704.63	32,233.40	19,629.64	58,889.00	26,655.60	45.3
1203 SERVICE AWARDS				236.00	708.00	708.00	
1400 OVERTIME PAY				333.32	1,000.00	1,000.00	
2200 PENSION	CONTRIBUTIONS	1,265.83	4,559.41	4,730.32	14,191.00	9,631.59	67.9
2300 LIFE INSURANCE		49.44	228.42	212.64	638.00	409.58	64.2
2301 AD @ D INSURANCE				30.32	91.00	91.00	
2302 HEALTH INSURANCE		573.63	1,509.02	1,261.32	3,784.00	2,274.98	60.1
2400 WORKMENS COMP				707.32	2,122.00	2,122.00	
2500 UNEMPLOYMENT	COMPENSATION	149.84	149.84	37.00	111.00	-38.84	-34.9**
3101 PROFESSIONAL SVCS		9,599.00	40,749.00	13,666.64	41,000.00	251.00	.6
3401 CONTRACTURAL SVCS		80.97	284.46	485.96	1,457.92	1,173.46	80.5
4000 TRAVEL		778.90	2,890.81	4,038.84	12,116.56	9,225.75	76.1
4001 MOTOR POOL				1,822.00	5,466.00	5,466.00	
4100 TELEPHONE		169.11	460.85	780.00	2,340.00	1,879.15	80.3
4202 MAILROOM		66.86	268.58			-268.58	
4203 POSTAGE		10.65	30.65	100.00	300.00	249.35	83.1
4400 RENT				333.32	1,000.00	1,000.00	
4502 INSURANCE	INTERDEPARTMENTAL	136.52	136.52	738.64	2,216.00	2,079.48	93.8
4600 REPAIR	CONTRACTORS			33.32	100.00	100.00	
4700 PUBLICATIONS DEPT		146.42	191.05	174.08	522.28	331.23	63.4
4800 EMPLOYEE	AWARDS AND FOOD	372.23	429.23	805.00	2,415.00	1,985.77	82.2
4905 DUES AND	SUBSCRIPTIONS	269.90	4,414.90	1,741.64	5,225.00	810.10	15.5
5100 OFFICE SUPPLIES	OUTSIDE	106.00	304.36	140.00	420.00	115.64	27.5
5102 OFFICE SUPPLIES	CENTRAL SUPPLY			66.64	200.00	200.00	
5204 MATERIALS				25.00	75.00	75.00	
5205 TOOLS AND	MINOR EQUIPMENT		154.48	66.64	200.00	45.52	22.8
9301 DEPRECIATION		170.82	170.82			-170.82	
ACTIVITY SUBTOTAL		22,650.75	89,185.80	63,115.92	189,347.76	100,161.96	52.9
TOTAL ALL ACTIVITIES		1,372,911.68	4,923,465.83	4,847,729.16	14,543,187.51	9,619,721.68	66.1
TOTAL INPUT DATA		1,372,911.68	4,923,465.83	4,847,729.16	14,543,187.51		
NUMBER OF ACCOUNTS SORTED				4,322.00		515.00	

Figure 37.
112

REPORT DATE: JAN 31, 1982

COST COMPARISON REPORT
FOR
TAMPA SEWER DEPARTMENT
(LEVEL II)

COMPARISON OF ACTUAL COST TO BUDGET

BUDGET CATEGORIES			ACTUAL COSTS		BUDGETED COSTS		BUDGET REMAINING	
ACCT #	ACCOUNT NAME		CURR PERIOD	YEAR TO DATE	YR TO DATE	ANNUAL AMT	AMOUNT	PERCENT
SEWER ADMIN.	OPERATIONS GENERAL (02)							
1100	EXECUTIVE SALARIES				10,691.32	32,074.00	32,074.00	
1201	REGULAR SALARIES		108,540.29	401,513.68	139,639.32	418,918.00	17,404.32	4.1
1202	TERMINAL LEAVE				2,100.00	6,300.00	6,300.00	
1203	SERVICE AWARDS				3,346.64	10,040.00	10,040.00	
2200	PENSION	CONTRIBUTIONS	13,499.27	53,725.31	19,995.64	59,987.00	6,261.69	10.4
2300	LIFE INSURANCE		769.56	2,725.95	952.64	2,858.00	132.05	4.6
2301	AD @ D INSURANCE				134.32	403.00	403.00	
2302	HEALTH INSURANCE		8,493.74	25,612.55	8,457.00	25,371.00	-241.55	-.9**
2400	WORKMENS COMP				2,386.64	7,160.00	7,160.00	
2500	UNEMPLOYMENT	COMPENSATION	1,156.82	1,156.82	184.64	554.00	-602.82	-108.7**
3100	PROFESSIONAL SVCS	EMPLOYEES			116.64	350.00	350.00	
3101	PROFESSIONAL SVCS		9,942.00	34,997.50	38,680.04	116,040.19	81,042.69	69.8
3200	AUDITING		2,555.00	2,555.00	6,110.00	18,330.00	15,775.00	86.1
3401	CONTRACTURAL SVCS		1,297.50	1,972.29	1,755.40	5,266.20	3,293.91	62.5
4000	TRAVEL		1,078.00	1,078.00	1,666.64	5,000.00	3,922.00	78.4
4100	TELEPHONE		1,185.68	3,688.31	5,051.04	15,153.20	11,464.89	75.7
4201	FREIGHT			19.00	33.32	100.00	81.00	81.0
4202	MAILROOM		450.97	2,073.31	1,400.00	4,200.00	2,126.69	50.6
4203	POSTAGE		1.72	128.51	166.64	500.00	371.49	74.3
4304	ENTPR - ADMIN UTIL		1,451.47	4,693.80			-4,693.80	
4400	RENT				166.64	500.00	500.00	
4403	LEASE/PUR CAP EQUIP		249.01	1,204.95	2,083.88	6,251.75	5,046.80	80.7
4502	INSURANCE	INTERDEPARTMENTAL	1,000.16	1,000.16	3,688.64	11,066.00	10,065.84	91.0
4600	REPAIR	CONTRACTORS		344.50	1,063.24	3,189.75	2,845.25	89.2
4700	PUBLICATIONS DEPT		222.67	912.12	2,353.84	7,061.60	6,149.48	87.1
4800	EMPLOYEE	AWARDS AND FOOD			33.32	100.00	100.00	
4900	ADVERTISING		468.24	3,682.94	2,247.32	6,742.00	3,059.06	45.4
4902	BAD DEBTS		21,583.53	57,475.67	15,000.00	45,000.00	-12,475.67	-27.6**
4903	LICENSE REFUND		1,740.80	2,284.80	2,000.00	6,000.00	3,715.20	61.9
4905	DUES AND	SUBSCRIPTIONS	133.00	183.00	1,100.00	3,300.00	3,117.00	94.4
4906	LICENSES		4.44	116.42	948.32	2,849.00	2,728.58	95.9
4911	EQUIPMENT ALLOCATION		1,371.68	5,631.97			-5,631.97	
4914	INTERDEPARTMENTAL		64,969.00	65,851.06	66,305.64	198,917.00	133,065.94	66.9
4919	SAFETY SERV INT CHGS		3,665.68	3,665.68	3,665.64	10,997.00	7,331.32	66.7
4920	UTILITY BILL CHGS		190,857.68	190,857.68	190,857.64	572,573.00	381,715.32	66.7
4923	WATER RESR CODR CHGS		5,558.68	5,558.68	6,948.32	20,845.00	15,286.32	73.3
4925	UTILITY MAIL OPENING		10,084.68	10,084.68	10,084.64	30,254.00	20,169.32	66.7
4926	CENTRAL CASHIER CHGS		4,332.00	4,332.00	4,332.00	12,996.00	8,664.00	66.7
4932	OTH CUR CHG - G F S				156,317.64	468,953.00	468,953.00	
5100	OFFICE SUPPLIES	OUTSIDE	124.32	1,027.58	1,853.52	5,560.57	4,532.99	81.5
5102	OFFICE SUPPLIES	CENTRAL SUPPLY	87.58	578.35	1,432.04	4,296.21	3,717.86	86.5
5203	OTHER SUPPLIES	OUTSIDE			83.32	250.00	250.00	
5204	MATERIALS			219.78	133.32	400.00	180.22	45.1

Figure 38.
113

REPORT DATE: JAN 31, 1982

COST COMPARISON REPORT
FOR
TAMPA WATER DEPARTMENT
(LEVEL III)

PAGE: 1

COMPARISON OF ACTUAL COST TO PRIOR YEAR 1981

COST CATEGORIES	ACTUAL COSTS CURRENT YEAR (YTD)	ACTUAL COSTS PREVIOUS YEAR (YTD)	COMPARISON REMAINDER	COMPARISON PERCENT
EXPENSE TYPE: 1. OPERATING SUPERVISION				
ACQUISITION				
EXECUTIVE SALARIES				
REGULAR SALARIES	9,705.04			
CETA				
OTHER LABOR				
BENEFITS - EXECUTIVE & REGULAR	1,976.12			
BENEFITS - CETA				
OTHER DIRECT COSTS				
GENERAL	42.53			
REPAIR & MAINTENANCE				
CHEMICALS				
POWER				
TOTAL COST OF ACQUISITION	11,723.69			
PURIFICATION				
EXECUTIVE SALARIES				
REGULAR SALARIES	17,371.31			
CETA				
OTHER LABOR				
BENEFITS - EXECUTIVE & REGULAR	3,580.56			
BENEFITS - CETA				
OTHER DIRECT COSTS				
GENERAL	89.39			
REPAIR & MAINTENANCE				
CHEMICALS				
POWER				
TOTAL COST OF PURIFICATION	21,041.26			

Figure 39.
114

REPORT DATE: JAN 31, 1982

COST COMPARISON REPORT
FOR
TAMPA SEWER DEPARTMENT
(LEVEL III)

COMPARISON OF ACTUAL COST TO PRIOR YEAR 1981

COST CATEGORIES	ACTUAL COSTS CURRENT YEAR (YTD)	ACTUAL COSTS PREVIOUS YEAR (YTD)	COMPARISON REMAINDER	COMPARISON PERCENT
TREATMENT				
EXECUTIVE SALARIES				
REGULAR SALARIES	361,160.23			
CETA				
OTHER LABOR				
BENEFITS - EXECUTIVE & REGULAR	78,653.00			
BENEFITS - CETA				
OTHER DIRECT COSTS				
GENERAL	162,527.52			
REPAIR & MAINTENANCE	64,294.96			
CHEMICALS	290,547.75			
POWER	818,622.26			
TOTAL COST OF TREATMENT	1,775,805.72			
COLLECTION				
EXECUTIVE SALARIES				
REGULAR SALARIES	251,143.80			
CETA				
OTHER LABOR				
BENEFITS - EXECUTIVE & REGULAR	62,816.60			
BENEFITS - CETA				
OTHER DIRECT COSTS				
GENERAL	134,408.89			
REPAIR & MAINTENANCE	12,387.89			
CHEMICALS	18,778.24			
POWER	196,825.97			
TOTAL COST OF COLLECTION	676,361.39			

Figure 40.
115

DATE: JAN 31, 1982

LEVEL IV REPORT OF
ACQUISITION COSTS FOR
TAMPA, FLORIDA

COST CATEGORY DESCRIPTIONS	SULPHUR SPRINGS INTAKE & PUMPING	SULPHUR SPRINGS TRANSMISSION	HILLSBOROUGH RIVER DAM	HILLSBOROUGH RIVER DAM GROUNDS
OPERATING GENERAL (3)				
1201 REGULAR SALARIES	18.29	18.31	18.30	18.31
(YTD)	261.60	261.65	261.64	261.66
2200 PENSION CONTRIBUTIONS	4.03	4.04	4.04	4.04
(YTD)	38.04	38.10	38.08	38.10
2300 LIFE INSURANCE	.21	.23	.23	.22
(YTD)	1.33	1.41	1.40	1.37
2302 HEALTH INSURANCE	1.39	1.41	1.41	1.41
(YTD)	15.26	15.33	15.35	15.34
2500 UNEMPLOYMENT COMPENSATION	.47	.48	.48	.48
(YTD)	.47	.48	.48	.48
4001 MOTOR POOL	6.78			
(YTD)	16.22	7.37	7.37	7.39
4100 TELEPHONE	73.70			
(YTD)	247.05	29.55	29.55	29.56
4301 UTILITIES - OTHER	6,945.18			
(YTD)	8,545.48	46.25	46.25	46.25
4502 INSURANCE INTERDEPARTMENTAL	.22	.22	.23	.22
(YTD)	.22	.22	.23	.22
5202 UNIFORMS	2.41			
(YTD)	3.13	.09	.09	.09
5204 MATERIALS	.14			
(YTD)	3.97	3.00	8.72	8.74
3 CURRENT EXP TOTAL	7,052.82	24.69	24.69	24.68
3 YTD EXPENSE TOTAL	9,276.22	546.35	580.11	580.18

Figure 41.
116

DATE: JAN 31, 1982

LEVEL IV REPORT OF
TREATMENT COSTS FOR
TAMPA, FLORIDA

COST CATEGORY DESCRIPTIONS	PLANT PUMP STATION OPERATING - PLANT	PLANT PUMP STATION ELECTRICAL	PLANT PUMP STATION MECHANICAL	PLANT PUMP STATION BLDGS/GRDS
1201 REGULAR SALARIES	832.25	207.47	459.84	
(YTD)	3,172.94	1,456.71	1,379.12	227.51
2200 PENSION CONTRIBUTIONS	116.58	29.05	64.34	
(YTD)	444.31	203.94	193.00	31.85
2300 LIFE INSURANCE	6.37	2.48	5.05	
(YTD)	15.70	10.40	12.14	1.22
2302 HEALTH INSURANCE	53.30	15.88	46.15	
(YTD)	139.98	61.45	111.54	7.21
2500 UNEMPLOYMENT COMPENSATION	20.68	7.20	14.83	
(YTD)	20.68	7.20	14.83	
4502 INSURANCE INTERDEPARTMENTAL	13.48	4.09	8.05	
(YTD)	13.48	4.09	8.05	
4911 EQUIPMENT ALLOCATION		10.23	45.93	
(YTD)	53.82	55.80	155.34	
5204 MATERIALS			37.12	
(YTD)		48.36	23,422.95	5.10
CURRENT COST CENTER TOTAL	1,042.66	276.40	681.31	
YTD COST CENTER TOTAL	3,860.91	1,847.95	25,333.50	272.89

Figure 42.
117

vertical axis representing the specific cost center within the utility operation. The dollar amount of operating and maintenance cost by object code number for each cost center for the current period is displayed at the appropriate intersection of a row and a column.

Separate reports are printed for each major utility function, with the data for each corresponding to its functional title. As an example, all Sanitary Sewer collection cost centers and related object codes will always print a Level IV report titled "COLLECTION".

The cost categories description relates to the FIN object coding system. Each object code represents a type of operating or maintenance expenditure for a particular cost center. The total of any row will give the total dollars expended for a particular object code within a particular utility function and the totals of the columns represent the total dollars charged to each cost center with the same utility function. In order to eliminate blank spaces or pages on the report, the program will print an account number (object code) only if it has an expense listed under the cost center.

Since costs are accumulated on this report by identifiable cost centers within the utility system, all cumulative costs for a particular cost center (physical point in most cases) can be related to the utility's service area map or schematic.

The Level V report as shown in Figure 43 is for the Sanitary Sewer Department only. This report is developed to print a Level IV type information but to accumulate cost by major cost center groups. Essentially, the Level V and Level IV appear alike, except the cost centers on Level IV are presented in detail.

The Level VI report for the Water Department is shown in Figure 44 (video screen), and Figure 45 (printout). For the Sanitary Sewer Department the Level VI video screen is shown in Figure 46, and the printout is shown in Figure 47. Since the Level IV was so voluminous, a program was developed to allow for the analysis of a single cost center thus eliminating the excessive amount of printing. The Level VI allows the user to request, either by video display or a printout, a specific cost center by one or all of the object codes (accounts) that had charges to that cost center for the current month, previous month, and year-to-date.

DATE: JAN 31, 1982

LEVEL V REPORT OF
TREATMENT COSTS FOR
TAMPA, FLORIDA

COST CATEGORY DESCRIPTIONS	001 PLANT PUMP STATION	002 JUNCTION CHAMBER 1	003 METER VAULT 1	004 SCREEN & GRIT 1
1201 REGULAR SALARIES	1,499.56	1,498.00	57.28	106.16
(YTD)	6,293.80	4,270.95	57.28	899.16
2200 PENSION CONTRIBUTIONS	209.97	209.79	8.02	14.88
(YTD)	881.16	598.05	8.02	125.96
2300 LIFE INSURANCE	13.90	12.44	1.00	.94
(YTD)	39.96	27.12	1.00	5.37
2302 HEALTH INSURANCE	115.33	117.45	8.60	5.63
(YTD)	324.48	241.46	8.60	40.53
2500 UNEMPLOYMENT COMPENSATION	42.71	36.43	2.62	1.53
(YTD)	42.71	36.43	2.62	1.53
4502 INSURANCE INTERDEPARTMENTAL	25.62	20.84	1.39	.96
(YTD)	25.62	20.84	1.39	.96
4600 REPAIR CONTRACTORS		2,974.30		
(YTD)		3,226.30		1,619.60
4911 EQUIPMENT ALLOCATION	36.16	106.26		
(YTD)	271.60	163.02	3.72	63.24
5200 FUEL AND LUBRICANTS		63.25		
(YTD)		63.25		
5202 UNIFORMS		9.90		
(YTD)		9.90		
5204 MATERIALS	37.12	38.68		
(YTD)	23,476.41	1,354.25		80.43
CURRENT COST CENTER TOTAL	2,000.37	5,107.34	78.91	130.10
YTD COST CENTER TOTAL	31,472.27	10,099.07	82.63	2,836.78

Figure 43.
119

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Friday, June 11, 1982 9:57 AM
OK, SEG #WRPT6
ENTER FILE ASSIGNMENTS:
> /
FILE ASSIGNMENTS COMPLETE.

LEVEL VI VIDEO DISPLAY


WHICH COST CENTER DO YOU WANT!
 (TYPE 2 DIGITS OR RETURN TO EXIT PROGRAM)
21
NR.  COST CENTER
21   HILLSBOROUGH RIVER  PLANT TREATMENT

WHICH EXPENSE TYPE! (1 DIGIT)
2
NR.  EXPENSE NAME
2    OPERATING ENGINEERING

DO YOU WANT TO SUM ALL ACCOUNTS! YES OR NO
YES


LEVEL VI VIDEO DISPLAY

COST CENTER 21  HILLSBOROUGH RIVER  PLANT TREATMENT

EXPENSE CODE   2  OPERATING ENGINEERING

ACT  ACCT  ACCOUNT NAME           CURRENT MO.  PREVIOUS MO.  YEAR TO DATE
***  ****  ********************  ***********  ************  ************
 21  1201  REGULAR SALARIES              .00           .00           .82
 21  2200  PENSION                       .00           .00           .12
 21  2302  HEALTH INSURANCE              .00           .00           .02
***  ****  ********************  ***********  ************  ************
           TOTALS ALL ACCOUNTS           .00           .00           .96


LEVEL VI VIDEO DISPLAY


WHICH COST CENTER DO YOU WANT!
 (TYPE 2 DIGITS OR RETURN TO EXIT PROGRAM)

OK, DATE
Friday, June 11, 1982 9:59 AM
OK,
```

Figure 44.

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DATE
Friday, June 11, 1982 9:59 AM
OK, ED
                                                                    PAGE:    1
      RPT601
EDIT
P999
.NULL.
^001^001
*
1

 DATA DATE:  JAN 31, 1982                    VIDEO REQUEST REPORT
                                                    FOR
                                          TAMPA WATER DEPARTMENT
                                              ( LEVEL VI )


 ****  COST CENTER     21  HILLSBOROUGH RIVER  PLANT TREATMENT

 ****  EXPENSE CODE     2  OPERATING ENGINEERING

 ACTV  ACCT  ACCOUNT NAME                          CURRENT MO.   PREVIOUS MO.  YEAR TO DATE
 ****  ****  ******************************************  ************  ************  ************
   21  1201  REGULAR SALARIES                                                        .82
   21  2200  PENSION              CONTRIBUTIONS                                      .12
   21  2302  HEALTH INSURANCE                                                       .02
 ****  ****  ******************************************  ************  ************  ************
           TOTALS ALL ACCOUNTS                                                      .96
BOTTOM
FILE
RPT601
OK, DATE
Friday, June 11, 1982 10:00 AM
OK,
```

Figure 45.

```
DATE
Monday, June 14, 1982 5:34 PM
OK, ED RPT602                                                    PAGE:    1
EDIT
P999
.NULL.
^001^001
+
I

 DATA DATE:  FEB 28, 1982                    VIDEO REQUEST REPORT
                                                    FOR
                                          TAMPA SEWER DEPARTMENT
                                              ( LEVEL VI )


 *****  COST CENTER     00100  PLANT PUMP STATION

 C-CTR  ACTV  ACCT  ACCOUNT NAME                                  CURRENT MO.  PREVIOUS MO.  YEAR TO DATE
 *****  ****  ****  ****************************************  ************  ************  ************
 00100    30  1201  REGULAR SALARIES                              862.74        832.25       4,035.68
 00100    30  2200  PENSION              CONTRIBUTIONS             120.81        116.58         565.12
 00100    30  2300  LIFE INSURANCE                                  7.77          6.37          23.47
 00100    30  2302  HEALTH INSURANCE                               92.36         53.30         232.34
 00100    30  2500  UNEMPLOYMENT         COMPENSATION              30.91         20.68          51.59
 00100    30  4502  INSURANCE            INTERDEPARTMENTAL         20.69         13.48          34.17
 00100    30  4911  EQUIPMENT ALLOCATION                           26.04                        79.86
 *****  ****  ****  ****************************************  ************  ************  ************
                    TOTALS ALL ACCOUNTS                        1,161.32      1,042.66       5,022.23

BOTTOM
FILE
RPT602
OK, DATE
Monday, June 14, 1982 5:34 PM
OK,
```

Figure 46.

```
OK.

DATE
Monday, June 14, 1982 5:33 PM
OK, SEG #SRPT6
ENTER FILE ASSIGNMENTS:
> /
FILE ASSIGNMENTS COMPLETE.

LEVEL VI VIDEO DISPLAY


WHICH COST CENTER DO YOU WANT!
 (TYPE 3 DIGITS OR RETURN TO EXIT PROGRAM)
001
NR.  COST CENTER
001   PLANT PUMP STATION

DO YOU WANT A 5 DIGIT COST CENTER!  YES  NO
YES

ENTER LAST 2 DIGITS OF COST CENTER
00
CC4  CC5
 0    0

DO YOU WANT TO SUM ALL ACCOUNTS! YES OR NO
YES


LEVEL VI VIDEO DISPLAY

COST CENTER 00100  PLANT PUMP STATION

CC  AC  ACCT  ACCOUNT NAME          CURRENT MO.  PREVIOUS MO.  YEAR TO DATE
**  **  ****  ********************  ***********  ************  ************
00  30  1201  REGULAR SALARIES         862.74       832.25       4035.68
00  30  2200  PENSION                  120.81       116.58        565.12
00  30  2300  LIFE INSURANCE             7.77         6.37         23.47
00  30  2302  HEALTH INSURANCE          92.36        53.30        232.34
00  30  2500  UNEMPLOYMENT              30.91        20.68         51.59
00  30  4502  INSURANCE                 20.69        13.48         34.17
00  30  4911  EQUIPMENT ALLOCATION      26.04          .00         79.86
**  **  ****  ********************  ***********  ************  ************
              TOTALS ALL ACCOUNTS      1161.32      1042.66       5022.23


LEVEL VI VIDEO DISPLAY


WHICH COST CENTER DO YOU WANT!
 (TYPE 3 DIGITS OR RETURN TO EXIT PROGRAM)

OK,
```

Figure 47.

SECTION 5

CONCLUSIONS

The following conclusions were reached based on the experience gained from installing MARS at a large water and wastewater system in Tampa.

1. MARS was less adaptable to the Tampa utilities than anticipated, as evidenced by the difficulties in installing the MARS operating at KCWD in the Water Department and Sanitary Sewer Department, City of Tampa, Florida. The following describes the conditions that created the difficulties:

   a. MARS was originally developed, using the KCWD and other water utilities as models. The system essentially derived its source data from the existing utility accounting systems. The Tampa accounting system (FIN), was significantly different from the accounting systems used by the KCWD and other model water utilities. Normally, there are some areas in the accounting systems that are modified slightly to function with MARS requirements or the requirements of any other management information system that may be used. However, FIN was so inflexible that the original MARS and some basic concepts had to be modified to function with FIN.

   b. Because of the size of the Tampa utility's operation, the amount of data entering the system was significantly greater than that of the smaller utilities. Consequently, larger system files for data processing and storage, along with different data handling techniques, were required of MARS.

   c. The modification of the original computer programs which operated in a batch mode on the large main-frame computer, for operation in an automatic interactive mode on a small computer proved to be a difficult conversion. This, combined with conceptual program changes, required careful planning and considerable additional programming effort.

2. The MARS concepts are transferable, as demonstrated by adaptation of the original four levels of the MARS reports to both the Water and Sanitary Sewer Departments in the same general format.

3. The adaptation of MARS to the Tampa wastewater operation was no more difficult than its application to the Tampa water utility. However, because of the differences between water and wastewater operations, the differences in specific use of common accounting systems, and even different management philosophies, separate sets of computer programs for each of the Tampa departments had to be developed. The Tampa application disclosed enough differences between water and wastewater operations to merit "water-unique" and "wastewater-unique" programs in future applications. Under conditions where the water and wastewater operations are integrated under a single fiscal manager, it may be possible to use one group of programs.

4. The use of Prime 250 or equivalent computer hardware for the MARS application at a large utility is feasible as evidenced by the MARS programs operating successfully on the Prime computer. In Tampa, since a financial reporting system already existed, MARS consists of only the cost analysis/ management information module. It is anticipated that the processing of this module on the Tampa Prime computer will require approximately one or two days per month (if monthly reports are required). Therefore, the computer will be idle the remainder of the month except as a means of data storage. However, both Tampa departments have numerous other computer programs that were intended to operate on the same computer system. Thus, in a situation where only the cost analysis module of MARS is required, the cost justification for use of a small computer is questionable, and it would appear that a more reasonable option may be to operate this system on remote, time sharing hardware.

5. The ease or difficulty of the adaptation of MARS to other water and wastewater utilities depends on the various conditions at the utility where the application is to be made. Solving the MARS/FIN interface consumed more time than anticipated at Tampa, as evidenced by the amount of time expended on research and the amount of program changes. For those utilities that have accounting/data systems similar to those of Tampa or to KCWD or can adjust their existing data collection or accounting system to either of the two MARS, the physical implementation of MARS can be reasonably accomplished. The difficulty will depend on the specific differences between accounting systems with which the MARS now functions. Generally, if different hardware and operating software is used, changes to MARS programs must occur. The extent of the changes may vary greatly depending on the hardware and software.

6. MARS assisted in detecting data errors that existed in FIN. The MARS programs edit each FIN expense item to insure that the code is correct with respect to the requirements of MARS. If the code is erroneous, the item is listed for correction. In order to maintain a balance, data corrected in MARS, must also be corrected in the original system (FIN) that feeds input data into MARS.

7. The value of MARS for Tampa Water Department and Sanitary Sewer Department has not yet been completely evaluated because, at the completion of this project, the MARS reports with accurate data have been available for only a short period of time.